

77 01487

10/2/86

SAFETY

in the ***County of Merced***



INSTITUTE OF GOVERNMENTAL
STUDIES LIBRARY

OCT 3 1986

UNIVERSITY OF CALIFORNIA

noise
fires
floods

pollution
nuclear fallout
geologic hazards
seismic hazards



SAFETY

in the *County* of *Merced*

an Element to the General Plan

BOARD OF SUPERVISORS

Al Goman, Chairman
Fred Wack
E.G. Nordman
Johnnie Ramondini
Danny E. Cozzi

PLANNING COMMISSION

Bert Crane
Arthur F. Abel
Joseph Ferry
Clarence Ahlem
Guernsey E. Beckstead
S.G. Miyake, Chairman
Joe Vincent

ELEMENT ADOPTED:

Planning Commission: Sept. 11, 1974

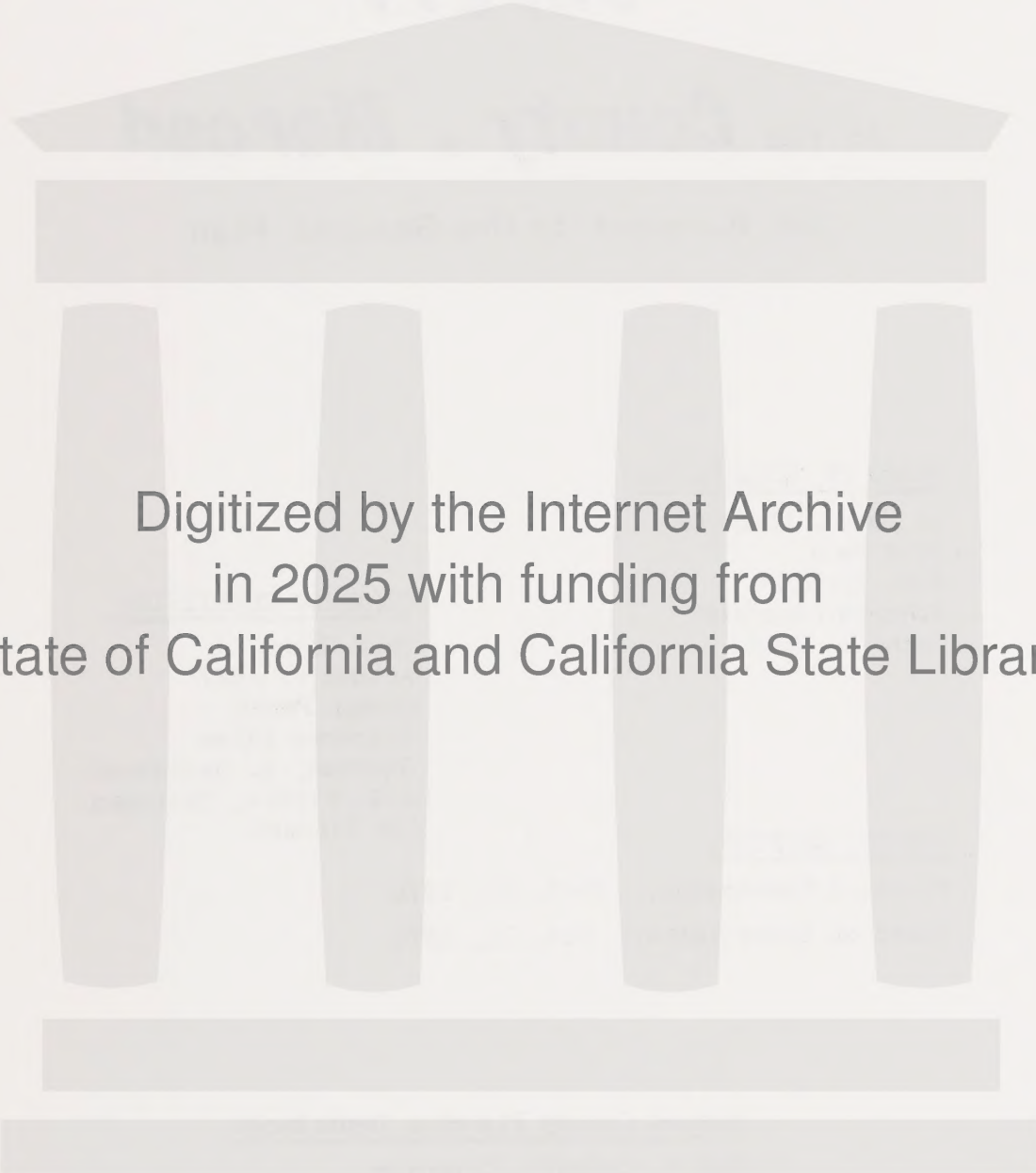
Board of Supervisors: Oct. 15, 1974

Merced County Planning Department

Hal F. Colwell, Director

Element Prepared by:

Trudi Mestnik, Senior Planner



Digitized by the Internet Archive
in 2025 with funding from
State of California and California State Library

<https://archive.org/details/C101742240>

<u>I N D E X</u>		Page
I.	Introduction	1
A.	Goals and Policies	2
B.	Conclusion	3
C.	Implementation	3
II.	Location and Geologic History	6
III.	<u>Geologic Hazards</u>	A-1
A.	Subsidence	A-1
1.	Ground-Water Withdrawal	A-1
2.	Oil and Gas Withdrawal	A-3
3.	Hydrocompaction	A-3
4.	Peat Oxidation	A-4
5.	Subsidence in the County of Merced	A-4
B.	Landslides	A-6
C.	Expansive Soils	A-7
D.	Erosion	A-9
IV.	<u>Seismic Hazards</u>	B-1
A.	What Causes Earthquakes?	B-2
B.	Measuring Earthquakes	B-2
1.	The Richter Magnitude Scale	B-5
2.	Earthquake Intensities	B-6
3.	California's Strong-Motion Program	B-8
C.	Seismic Activity in the State of California	B-11
D.	Seismic History in the County of Merced	B-14
E.	Seismic Hazards in Merced County	B-20
1.	Groundshaking	B-23
2.	Tectonic Subsidence	B-29
3.	Reservoirs and Seismicity	B-30
4.	Seiches	B-36
5.	The "Dam Safety Act"	B-37
6.	Existing Structural Hazards	B-39

V. <u>Pollution</u>	C-1
A. <u>Air Pollution</u>	C-2
1. Some Important Pollutants	C-5
a. Sulfur Dioxide	C-5
b. Carbon Monoxide	C-7
c. Carbon Dioxide	C-8
d. Nitrogen Oxides	C-9
e. Hydrocarbons	C-10
f. Ozone	C-11
g. Lead	C-12
h. Photochemical Smog	C-13
2. The Clean Air Act	C-14
3. San Joaquin Valley Air Basin	C-16
a. Geography	C-16
b. Meteorology	C-18
c. Industry	C-19
d. Sources of Pollutants in the San Joaquin Valley Air Basin	C-19
"Valley's Smog Potential is Similar to L.A.'s" (Merced Sun Star)	C-28
"The Endangered Valley" (Sun Star)	C-30
B. <u>Water Pollution</u>	D-1
1. Pollution Sources	D-1
a. Industrial Wastes	D-1
b. Municipal Wastes	D-1
c. Agricultural Wastes	D-2
d. Oil Spill	D-2
2. Treatment Practices	D-2
a. Collection Only	D-3
b. Primary Treatment	D-3
c. Secondary Treatment	D-3
d. Tertiary Treatment	D-4
3. Water Quality Control	D-4
4. Ralph Nader's Task Force and California's Water Quality Control	D-6

5.	San Joaquin Basin Subregion	D-12
a.	Surface Water	D-12
b.	Ground-Water	D-13
6.	Water Quality Problems	D-13
7.	Water Pollution Sources in our Basin	D-15
a.	Surface Run-off	D-16
b.	Sand and Gravel	D-16
c.	Municipal Waste	D-16
d.	Industrial Waste	D-17
e.	Thermal Discharge	D-18
f.	Rural-Domestic Waste	D-18
g.	Irrigation Return Flow	D-19
h.	Animal Waste	D-20
C.	<u>Noise Pollution</u>	E-1
1.	Measuring Noise	E-3
a.	Frequency	E-3
b.	Intensity	E-3
c.	HUD Standards	E-4
2.	Sources of Noise	E-6
a.	Transportation	E-6
b.	Industrial Noise	E-7
c.	Construction	E-8
d.	Recreation	E-8
e.	Sonic Boom	E-9
f.	Domestic Noise	E-9
	"Quiet Home? Not These Days" (Sun Star)	E-10
3.	Effects of Noise	E-11
a.	Effects of Noise on Man	E-11
b.	Effects of Noise on Animals	E-12
c.	Effects of Noise on Structures	E-12
d.	Noise as an Instrument of Torture	E-13
4.	Noise in the County of Merced	E-14
5.	The "Noise Element", a Part of the General Plan	E-16

VI.	<u>Floods</u>	F-1
	A. Floods in California	F-1
	1. Structural Flood-Control Measures	F-1
	2. Non-Structural Measures	F-3
	B. Floods in the County of Merced	F-3
	1. Flood-Control Measures in our Community	F-3
	C. Flood Disaster Protection Act of 1973	F-6
	Merced County Ordinance No. 586, "Flood Plain Land Use Ordinance"	F-8
VII.	<u>Wildland Fires</u>	G-1
	A. California's Wildland Fire Problem	G-1
	1. Topography	G-1
	2. Fuels	G-2
	3. Fire Weather	G-3
	4. Forest and Grass Fires	G-4
	5. Causes	G-5
	6. Rehabilitation of Burned Wildlands	G-5
	B. Grass Fires in the County of Merced	G-7
VIII.	<u>Nuclear Fallout</u>	H-1
	A. The Atomic Age	H-1
	1. Radioactivity	H-1
	2. Alpha, Beta and Gamma Rays	H-1
	3. X-Rays	H-2
	4. Long-Term Effects	H-3
	B. A Nuclear Explosion in the United States	H-5
	1. What is Fallout?	H-5
	2. Fallout Protection	H-5
	3. Emergency Broadcast System	H-6
	C. Preparation for Survival	H-7
	1. Survival Supplies	H-7
	2. Fallout Protection Shelters	H-8
	3. Be Prepared	H-9
	"Above Ground Home Fallout Shelter", Building Plans, Dept. of Defense	H-10
IX.	<u>Appendix</u>	
	Bibliography	
	"Open Space Overlay Ordinance", Ordinance No. 713	

... ABOUT "CIVIL DEFENSE" ...

News stories about a disaster may report that the fire department fought the blaze, the police force cordoned off the disaster area and helped remove the injured, the public works department cleared away the debris, and doctors treated casualties. Some people ask, "Yes, but where was Civil Defense?" The answer is that "civil defense" was there. It was the fire, police, public works, and other forces of government dealing with the emergency in an effective, coordinated manner.

"Civil defense operations" occur when a local government responds to any massive emergency—a tornado, flood, or other natural disaster; a major fire, explosion, or industrial accident; a civil disorder or disturbance; or a nuclear attack.

The "Merced County Emergency Operations Plan", prepared by the Merced County Department of Public Works, Office of Emergency Services, will be made a part of this Safety Element.

I. Introduction

Over the years much damage has been done to man's developments by earthquake shaking, subsidence, unstable soils, floods, etc. Much damage could have been avoided by keeping development from those areas that display the most severe risk, or by properly designing structures to withstand the hazards. Sufficient knowledge is now available to determine which areas should be avoided, and which will require special care in design to withstand nature's forces that are likely to occur.

An awareness and understanding of the potential risks and costs involved for development in such hazardous areas, coupled with proper design and adequate protective development standards can enable development to take place in such areas. Improper design of structures in such areas, however, can result in structural damage, personal injury, and costly corrective clean-up measures.

We live in an environmentally closed system, and the holding capacity of our air, water and land is limited. Population is an essential ingredient in the total environment which includes land use, transportation, water, air, solid waste management, etc. Until the last decade, man has reproduced himself with little thought as to the consequences to society. Today we are reaping the effects of such an implicit population policy. Planning must examine growth trend lines with a conscious awareness of the results of such growth and an awareness of the environmental consequences of alternative trends.

The side effects resulting from the technology man has created are having unforeseen effects. Air, water, and thermal pollution, solid waste, radiation, pesticides and noise, to mention just a few. This element is directed at analyzing hazards caused by nature which create danger to the life of man and his property, and the cause and effect relationships which surround pollution problems - which people create, and which people can solve.

Title VII of the Government Code, Article 5, requires all cities and counties to adopt nine elements as parts of their General Plan, one

of them is the Safety Element. It overlaps partly with the Seismic Safety Element, which the Board of Supervisors adopted on April 9, 1974, and also touches upon the subject of noise, which is a separate requirement that has to be adopted before September 20, 1974. The Open Space Element, adopted with the Conservation Element on September 4, 1973, discusses "Open Space for Public Safety" besides protection of natural and man-made resources.

A. Goals and Policies

It is the goal of the County of Merced, to achieve a harmonious relationship between population and our natural environment.

It is the goal of the County of Merced to identify potential geologic and seismic hazards in the county, and to guide development and land use for the protection, safety, and benefit of present and future generations.

It is the goal of the County of Merced to promote air quality compatible with health, well-being, and enjoyment of life. To prevent to the greatest degree possible, public nuisance, property and vegetative damage, or deterioration of aesthetic qualities resulting from air pollution contaminants.

It is the goal of the County of Merced to assure the adequate supply and quality of water to meet the present and future needs of our population.

It is the goal of the County of Merced to maintain and enhance the present high level of agricultural production, urban health and well-being, and at the same time minimize any harmful environmental impact associated with the use of fertilizers and pesticides.

It is a policy of the County of Merced

- to balance social, economic and environmental considerations in land use decisions.
- to respect and protect private property rights, while protecting resources, environment, and the safety of the people.

B. Conclusion

Regulations to minimize threats to public health and safety enjoy almost a special presumption of constitutionality. Although there has been little experience in regulating land use to protect public health and safety, there is every reason to believe that the objectives will present the strongest argument for upholding land regulations.

One kind of regulation directed at protecting the homeowner against possible injury to himself is the building code used. In many situations, our society does not allow people to assume all the risks. For example, there are cases upholding motorcycle crash helmet statutes. In a case involving a statute limiting working hours, (*Holden vs. Hardy* 169 U.S. 366, 397), the U.S. Supreme Court expressed the following policy:

"The whole is no greater than the sum of all parts, and when the individual health, safety and welfare are sacrificed or neglected, the State must suffer."

There is little doubt that the objective of reducing risks to individuals permits imposition of more stringent building codes, regulations, and strict conditions attached to the approval of proposed developments. In cases where the general public is effected, the posting of a bond may be required, to ensure compliance. It also seems certain that a reckless or careless activity, such as constructing a building directly over an active fault trace, should be prohibited.

C. Implementation

Merced County Ordinance No. 713, also called the "Open Space Overlay Ordinance", was adopted by the Board of Supervisors on December 18, 1973. With this Ordinance the "Environmental Permit" was created, making it a requirement for most developments which are proposed to be located in "environmental constraint areas". A constraint area is the approximate location of natural or man-made resources, wildlife, historic or scenic landmarks, geologic and

seismic hazards, flood plains and fire-hazard areas, etc. An Environmental Permit is attached to the building permit, to assure compliance with stated conditions. If an environmental permit is denied, the proposed project at proposed site is automatically disapproved.

This "Safety Element", being a part of the Merced County General Plan, will be implemented through the "Open Space Overlay Ordinance". All safety hazards discussed in this Element are considered to be "constraint areas". Hazards that cannot be pinpointed to a specific location, like Air and Water Pollution, will be considered during the evaluation of every individual application.

All maps that are included in this Safety Element are subject to revision, and show only the approximate location of hazards. They have been prepared by State and Federal agencies. As their research progresses and new maps are received by us, these revised maps will then be used to guide the decisions of the County Planning Commission, Board of Supervisors, and the staff of the Planning Department. In certain cases engineering and soil tests will have to be submitted by the applicant. Whenever an Environmental Impact Report, E.I.R., is required, all mitigation measures will be added as conditions on the Environmental Permit.

Whenever it is felt that no special conditions need to be attached to the Environmental Permit, because compliance with the Uniform Building Code and other adopted County Ordinances is enforced anyway, then the applicant will only be made aware of the hazards existing or possible in the general area of proposed site.



LOCATION MAP
MERCED COUNTY
CALIFORNIA

II. Location and Geologic History

Merced County, located near the geographic center of California in the San Joaquin Valley, is bordered by two mountain ranges. To the east lie the granitic Sierra Nevada, and to the west the Diablo Range of sedimentary and metamorphosed sedimentary rocks. Small intermittent streams enter the valley from the semiarid mountains of the Diablo Range, but soon are lost on alluvial fans, while perennial rivers flow from the more humid and larger drainage areas of the Sierra Nevada. Water has spread over the surface, has deposited sand, silt and clay - eroded from pre-existing soils and rocks, and has built up large coalescent alluvial fans along each side of the valley. The larger and more gently sloping fans on the east side are built up principally by deposits from granitic rock sources, whereas the smaller and generally more steeply sloping fans on the west are built up by material originating in the sedimentary rocks of the Coast Range. As a result, the valley floor consists mainly of two kinds of alluvial materials that differ widely in mineralogical origin, which is reflected in the soils.

All the rivers and creeks entering the valley, except the San Joaquin River, have built fairly well defined alluvial fans that form slopes of the valley floor. The San Joaquin River, however, is well entrenched until the river reaches the valley trough. East of Los Banos, floodwaters and sediments were distributed under natural conditions by numerous meandering sloughways. Some of the alluvial material is fresh and unweathered, some has been developing into soil for thousands of years. Texture ranges from fine clay and silt in the lower basin area, to gravel and cobblestone in the old high terraces.

The Sierra Nevada is largely one gigantic block that has been tilted westward, caused by faulting and uplifting of the east edge. The western side is depressed, and overlain by the sedimentary deposits of the valley. The basement complex of the Sierra Nevada

consists of metamorphosed shale, sandstone, limestone, and chert, intruded by plutonic rocks. Fossils found in the metamorphosed rocks in a few localities indicate that the sea invaded the area at various times in the Paleozoic era, and also in the Triassic and Jurassic periods.

The Coast Ranges in the west, the barrier between the Great Valley and the Pacific Ocean, evolved as a result of folding and faulting, and are composed chiefly of sedimentary rocks that are sharply deformed into many folds. They are broken by numerous faults, the San Andreas Fault being the most notable structural feature. The predominant rocks of the Coast Ranges are resistant marine sedimentary rocks of Jurassic and Cretaceous age. Older igneous and metamorphic rocks make up most of the remainder of the surface exposures, and underlie the sedimentary rocks at depth. To the east the rocks of the Coast Ranges dip steeply under the alluvial fans of the valley, forming an abrupt boundary with hardly any transitional foothill belt between the two.

While the valley is barely above sea level, the foothills of the Sierra Nevada in the east rise to 500 feet within Merced County, and the Coast Range has an elevation of 2,000 feet on the western County border. (See topographic map, page 9).

Geologic history of the San Joaquin Valley and bordering mountains

Epoch	Coast Ranges	San Joaquin Valley	Sierra Nevada
Late Cretaceous	Shallow-water marine sediments several thousand feet thick deposited in sinking geosyncline.	Deposition of clastic sediments in shallow sea occupying the northern and western parts of present valley. Downwarping keeps pace with deposition.	Erosion uncovers granitic rock over broad areas. Rocks of early Mesozoic and Paleozoic age folded in low parallel northwest-trending ranges and intruded by igneous rocks of granitic composition (Nevadan revolution).
Paleocene	Deposition of marine sediments in restricted troughs; sedimentation practically uninterrupted along east flank of present Coast Ranges.	Sea retreats westward but marine deposition is continuous in northwestern part of valley.	Erosion continues; western part of range presumably well to west of present Sierra Nevada.
Eocene	Marine deposition along east flank and at north end of Diablo Range. Upwarping in early Eocene raises much of area above sea level.	Shallow sea occupies most of valley area, shore locally encroaches on Sierra Nevada and Coast Ranges. Streams from Sierra Nevada deposit nonmarine clay and quartzose sand along eastern border of valley.	Earliest volcanic activity (andesitic and rhyolitic rocks extruded). Moderate uplift or change in base level causes dissection of weathered rocks. Tropical climate and gentle slopes result in deep weathering of rocks in place on western slope.
Oligocene	Most of ranges above sea level. Marine deposition in narrow basin along east flank.	Volcanic sediments of rhyolitic composition are deposited in northeastern part of valley; nonvolcanic continental deposition in southeastern part. Marine deposition along western margin and at south end of valley.	Eruptions of volcanic material, including much rhyolitic ash, continues. Erosional debris locally dams and diverts streams.
Miocene	General trend of present structural and topographic features is established. Volcanic activity is recorded by deposition of local ash beds. Most of the area is submerged in middle and late Miocene, great thickness of marine sediments deposited along east flank of Coast Ranges including abundant organic siliceous shales. Subaerial erosion in most of area during early Miocene.	Deposition of nonmarine volcanic sediments in northeastern part of valley and nonvolcanic continental sediments in southeastern part of valley contemporaneous with marine sedimentation in western and southwestern area. Organic siliceous shale abundant in marine deposits. Valley largely above sea level during early Miocene.	Uplift along faults on eastern border elevates range several thousand feet. Mudflows of andesitic detritus originating near crest of range cover most of western slope opposite northern San Joaquin Valley, thereby disrupting older drainage. Volcanic eruptions widespread north of Tuolumne River, local eruptions to south.
Pliocene	Folding and faulting on regional scale in late Pliocene outlines present form of ranges. Northern part of central Coast Ranges undergoing subaerial erosion, concurrently with deposition of marine sediments in local basins in southern part of ranges during early and middle Pliocene.	Extensive lake occupies western part of valley for a time in late Pliocene. All the valley above sea level in late Pliocene. Great thicknesses of continental deposits accumulating in downwarping basins along western and southern margins of valley. Streams from Sierra Nevada depositing generally fine-grained alluvium on east side, includes much coarse-grained volcanic detritus in early Pliocene. Deposition of marine sediments in southwestern part of valley during early and middle Pliocene.	Relative structural stability, only minor crustal movement. Great volcanic activity wanes; consequent streams erode volcanic deposits and move them toward San Joaquin Valley.
Pleistocene	Major faulting and folding accentuates existing structures. Erosion of mountains with deposition in intermontane valleys.	Deposition of coarse alluvial deposits by streams draining Sierra Nevada contemporaneous with dissection of tilted older alluvial-fan deposits. Lowering of sea level during Pleistocene glaciation causes San Joaquin River and major tributaries to excavate trenches graded to lower base level. Alluvial fans on east side tilted with Sierra Nevada block. Coast Range streams continue to build alluvial fans in downwarping area on west side of valley.	Several stages of glaciation in higher parts of range. Glacial scouring locally important in modifying land forms. Last major uplift of range along faults on eastern margin with additional westward tilting.
Recent	Subaerial erosion forms present topography. Minor structural movements continuing to present; many faults and folds still active; earthquakes frequent.	Deposition of stream-channel, alluvial-fan, overflow, and lacustrine deposits contemporaneous with mild dissection of tilted alluvial fans on east side of valley. Deposition of broad coalescing alluvial fans on west side and south end of valley. Sediments generally finer grained than in Pleistocene. Trenches of San Joaquin River and major tributaries backfilled as sea level rises with retreat of continental glaciers.	Subaerial erosion. Glacially scoured features being modified by weathering, erosion, and deposition.

Source:
Geological Survey Water-Supply Paper 1469, Prepared by the
U.S. Department of the Interior in cooperation with the
California Department of Water Resources, 1959.

Geologic Hazards



III. Geologic Hazards

Many geologic hazards exist in our County which, if ignored, can cause bodily harm and structural damage. However, when we are aware of them, strict enforcement of the building and grading codes, or even denial of a proposed development, will protect the people to a great extent.

A. Subsidence

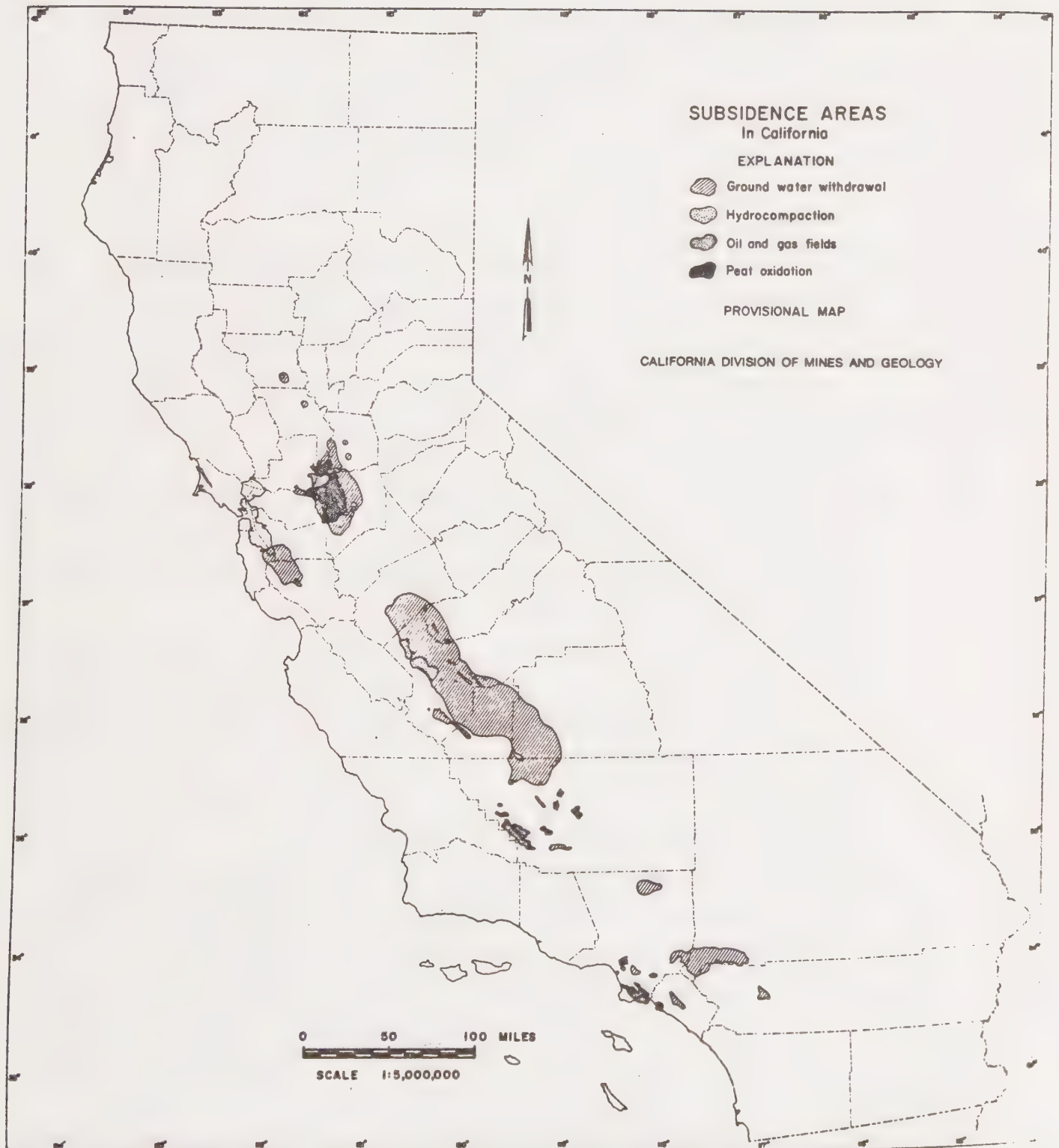
Subsidence of the ground is occurring in many areas in California, and is especially costly if it occurs after construction has taken place. It is very important to recognize potential and existing subsidence areas and the possible magnitude of effects at the land surface, before development of any kind is undertaken.

There are four types of subsidence known to man, which happen slowly over a long period of time. They are: Ground-Water Withdrawal, Oil and Gas Withdrawal, Hydrocompaction, and Peat Oxidation Subsidence.

A fifth type of subsidence, happening suddenly, is Tectonic Subsidence. This is compaction of the soils due to ground-shaking during earthquakes, and will be described under "Seismic Hazards".

1. Ground-Water Withdrawal Subsidence

is a deep subsidence. It is the most extensive and the most costly kind of subsidence. It occurs only in valley areas underlain by alluvium. Compaction of sediments at depth has caused much damage to water wells. Lengthy surface structures like canals, drains, sewers and other pipelines that are sensitive to slight changes in elevation, have been seriously effected. Subsidence is worsened in areas of confined ground-water, and where beds of compressible silts and clays are found. By injecting water under high pressure into the depleted reservoirs, subsidence can



Subsidence areas in California.

be slowed or even stopped.

On the west side of the San Joaquin Valley is the world's largest area of subsidence due to ground-water withdrawal. As of 1966, more than 2,000 square miles had subsided more than one foot, and the area that had subsided more than ten feet was 70 miles long. Maximum subsidence was 28 feet by 1969.

2. Oil and Gas Withdrawal Subsidence

is also in the category of "deep" subsidence. It happens as a result of oil or gas withdrawal, and occurs in much the same way as does subsidence caused by ground-water withdrawal. Most areas of gas and oil withdrawal subsidence are located in the Los Angeles basin, where considerable damage has occurred to works of man. Surface deformation within the subsidence areas has caused extensive damage to pipelines, railroad tracks and buildings.

3. Hydrocompaction Subsidence

is most common in the desert, but also has been noticed in some of the semi-arid regions of Southern California, and on the alluvial fans along the western side of the San Joaquin Valley. Hydrocompaction occurs above zones of saturation, usually a few hundred feet below the land surface, and is classified as "shallow" subsidence. It occurs when certain open-textured soils lose their strength and consolidate under their own weight. When these soils become saturated with water for the first time, consolidation and subsidence occur. For this reason, irrigation of crops has been made difficult in some areas. Ditches, canals, roads, pipelines, electric transmission towers and buildings have been damaged or destroyed. In California, about 124 square miles of land surface has subsided due to hydrocompaction, or probably would subside if irrigated. Subsidence of 3 to 5 feet is common, and more than 10 feet has been recorded in some small areas.

Hydrocompaction on the west side of the San Joaquin Valley required special consideration during construction of the California Aqueduct. The California Department of Water Resources employed a remedial procedure, involving the ponding of water along the aqueduct route. The infiltration of ponded water saturated the underlying sediments and allowed these to consolidate, until all significant subsidence had taken place. Construction of the aqueduct then proceeded. Engineering costs for this were \$ 2,700,000.-, and special ground preparation costs were nearly \$ 13,000,000.-.

The Delta-Mendota Canal was built without knowledge of the problem, and later subsidence of certain portions of the canal required the spending of unknown large amounts of money for repair.

4. Peat Oxidation Subsidence

is also a shallow subsidence, and is the result of several different factors operating together. These factors include: oxidation of the peat, burning, wind erosion, shrinkage from drying, and compaction by tillage machinery. Of these five factors, oxidation of the peat seems to be the single most important factor. The Delta of the San Joaquin and Sacramento Rivers is believed to comprise the second largest continuous body of peat lands in the United States, exceeded only by the Everglades in Florida.

5. Subsidence in the County of Merced

For many years ground-water has been overdrawn in our County, and subsidence has occurred around Los Banos and south of it. A newly subsiding area has been discovered near El Nido, east of the San Joaquin River. The map on page A-5 shows the existing subsidence area in Merced County, and the "Principal Ground-Water Basin", which has a high potential for future subsidence if we keep overdrawing our water supply. This map has been prepared from Fig. 3, page A-2, a map furnished by the California Division of Mines and Geology, and is subject

MERCED COUNTY

KNOWN AND POTENTIAL
SUBSIDENCE AREAS

KNOWN

GROUND WATER WITHDRAWAL

POTENTIAL

PRINCIPAL GROUND WATER BASIN

Source:
Calif. Div. of Mines and Geology
Enlarged from Bulletin 198, page 44



to revision. The area shown is only "approximate", and engineering tests will be needed where subsidence is suspected, before some developments can be approved.

B. Landslides

Landslides are another geologic hazard that has to be expected in certain parts of Merced County, mostly west of Interstate 5, in the foothills of the Coast Range.

A landslide is the downhill movement of masses of earth material under the force of gravity. Movement may be rapid, or so slow that a change of position can be noted only over a period of weeks or years. The areal size of a landslide can range from several square feet to several square miles.

It is most important to recognize the existence of an old slide, or the probability of a future slide. Slopes covered with deep soils, or hillsides heavily saturated with ground-water are potential slide areas. Where bedding or jointing of rock materials and hill slope directions tend to be the same, slide possibilities are greatly increased. Fault zones, regardless of recency of movement, are also generally potential landslide areas. To be sure whether this danger exists on a future development site, detailed geologic mapping, trenching and drilling is required. After the landslide potential has been recognized and assessed at a site, future development is designed to take landslide hazards in the area into consideration.

In order to maximize the health and safety of the study area residents, any development should be carefully planned, to cause minimal acceleration of these geologic processes. Moreover, these processes do not recognize property lines. Adverse land use on one property can trigger landslides that may directly offset or later spread to adjacent properties. Much landslide damage can be avoided by leaving hazardous areas undeveloped.

As mentioned before, the west side of Merced County has a high

potential for landslides. For certain proposed developments in that area, a detailed engineering site study should be required prior to designing any plans. These studies should be carried out by private consultants hired by the developer. The Grading Ordinance, Chapter 70 of the Uniform Building Code, should be followed as minimum standard requirement, and should be strictly enforced.

C. Expansive Soils

Expansive soils are earth materials which greatly increase in volume when they absorb water, and shrink when they dry out. Expansion is most often caused by clay minerals. Although not very common, expansive rocks are also known; these are clay-stone or altered volcanic tuffs.

The basic cause of expansion is the attraction and absorption of water into the expansible crystal lattices of the clay minerals. The water may be derived from moisture in the air, rain, or ground-water beneath the foundation of buildings. When structures are placed on expansive soils, foundations may rise each wet season, and fall each dry season. Movements may vary under different parts of a building with the result that foundations crack, various structural portions of the building get distorted, and doors and windows get warped so that they don't function properly.

The adverse effects of expansive soils can be avoided through proper drainage and foundation design. In order to design an adequate foundation, however, the condition must be recognized through appropriate laboratory soil testing. Building site evaluations are normally conducted by consulting soil or foundation engineers retained by developers.

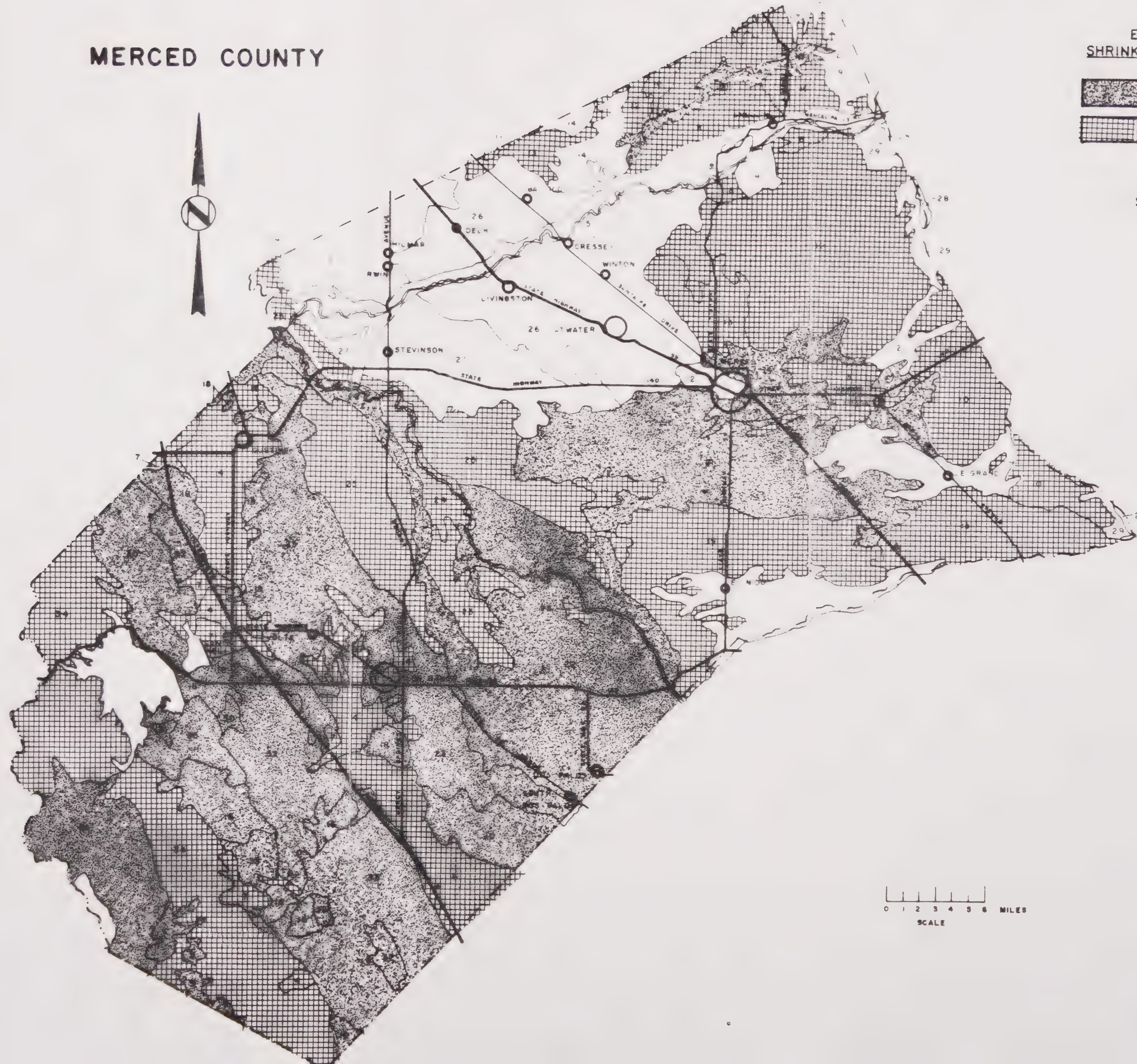
Procedures employed in expansive soil testing are found in many codes and regulations. Chapter 70 of the Uniform Building Code requires that soils testing be done on all graded building sites. Lending institutions, including Veterans Administration

MERCED COUNTY

EXPANSIVE SOILS SHRINK - SWELL BEHAVIOR



Source:
 U.S. Dep. of Agriculture,
 Soil Conservation Service



and FHA, also require soils tests. The Subdivision Map Act of the Business and Professions Code requires that on all tract developments of 5 lots or more, soil conditions be studied by a registered civil engineer, unless waived by the local government building official. By following a variety of test procedures, a qualified engineer can detect the presence of expansive soils, and recommend needed corrective measures.

The cost involved in recognizing and correcting expansive soils usually is not great. Corrective costs after construction can be high, compared to preventive costs carried out before construction. In some problem areas, chemical stabilization such as lime injections can be effective. More often, a new foundation must be placed beneath the existing structure, and costs can amount to 25 percent of the total value of the building. Nonetheless, new foundations may be justified, because damage due to expansive soils can reduce the value of a building by 10 to 80 percent.

At the present time, adequate techniques are in existence to control damage from expansive soils, but regulatory vigilance should be maintained and improved, to insure that site investigations and, if warranted, proper engineering tests are carried out before construction. If existing ordinances are rigorously enforced, losses to future construction could be reduced to near negligible levels.

D. Erosion

Erosion involves generally two somewhat distinct problems - the wear and removal of material from one site, and its deposition at another. The removal of soils through erosion can be damaging in situations of sheet and gully erosion of land surfaces, the wind-blown denudation of lands, the erosion of stream courses and banks, and the erosion of coastal cliffs, dunes and beach areas. Deposition damage effects flood plains, rivers, lakes, reservoirs, and may clog drainage structures. Activities by man

frequently accelerate erosion-related damages and losses.

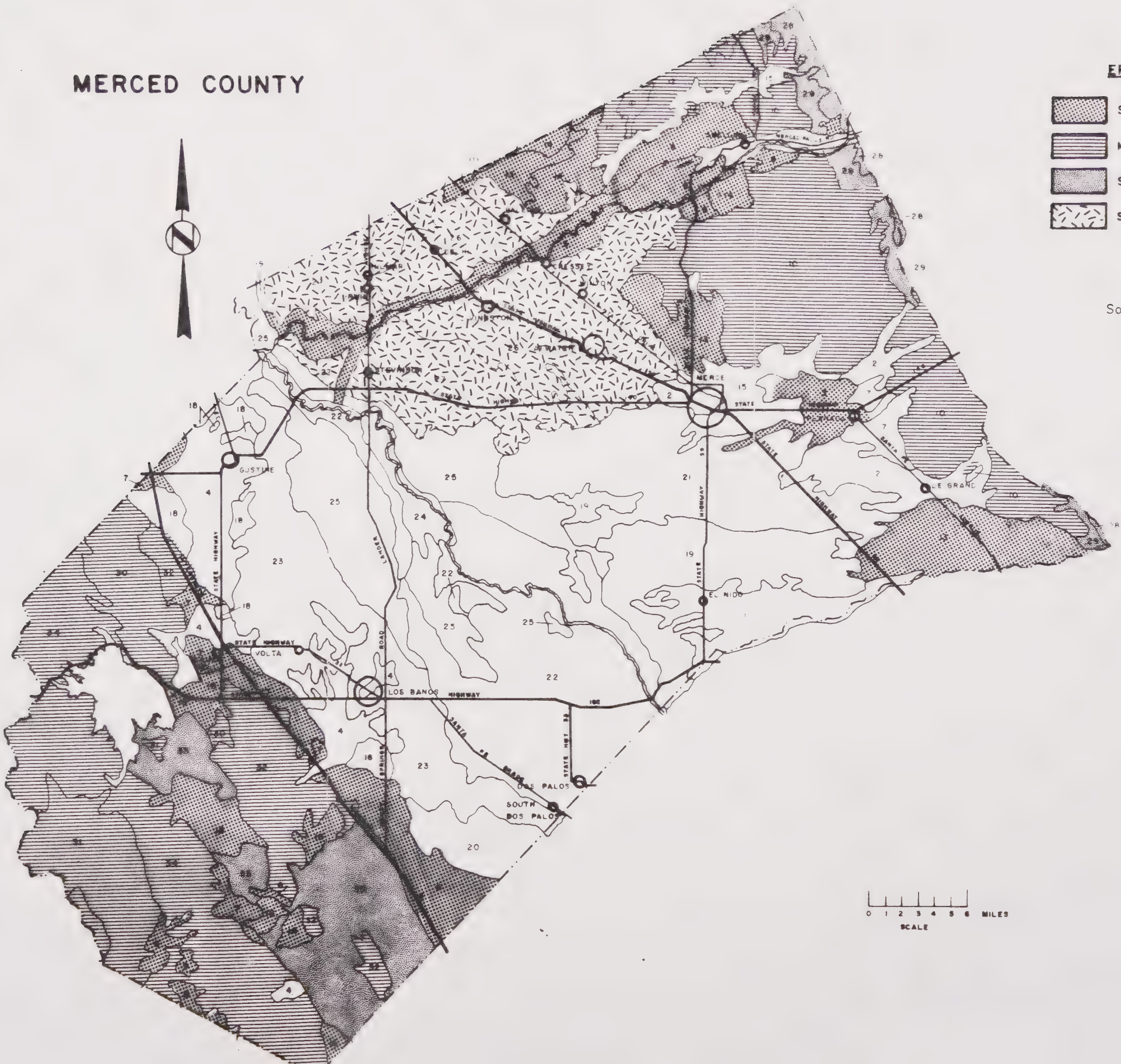
Erosion is a relatively well understood and constrollable problem insofar as it effects urban areas. In most areas undergoing development, however, the natural erodibility of the soil is far less important in determining the severity of future erosion, than is the type and amount of land-modification being performed.

The reduction of erosion losses in urban areas is the responsibility of both, the developer who modifies the land surface by landscaping and construction of retaining walls and drainage systems, as well as the governmental agency which reviews and - to some extent - controls land modification. Following project completion, the user of the property assumes the continuing responsibility of erosion control through maintenance and landscaping and drainage systems.

Erosion problems in urban areas in California are, for the most part, well under control in those areas where appropriate engineering practices are properly applied. In localities where erosion cannot feasibly be prevented or controlled, moderate losses will continue to occur. Most urban areas, however, have public works departments fully able to cope with erosion problems.

The map on the preceding page shows the areas in Merced County where erosion problems exist. A very serious problem is caused by the land identified as "severe wind erosion", because it adds a significant amount of particulate matter to the air pollution in our County, and the San Joaquin Valley Air Basin.

MERCED COUNTY



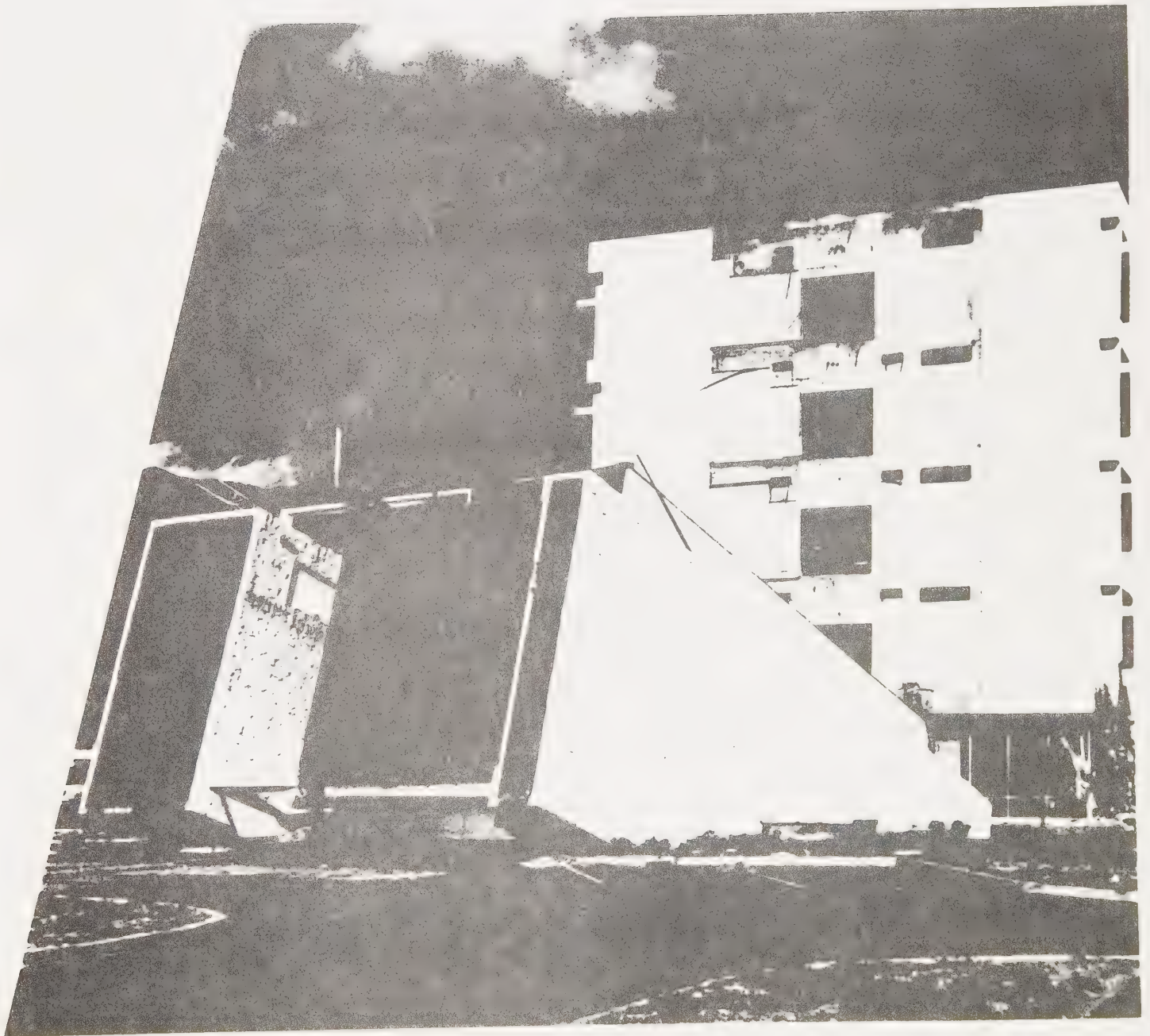
EROSION HAZARD

- SLIGHT
- MODERATE
- SEVERE
- SEVERE WIND EROSION

Source:
U.S. Dept. of Agriculture,
Soil Conservation Service



Earthquakes



IV. Seismic Hazards

Scientific understanding of earthquakes is of vital importance to the nation. As the population increases, expanding urban development and construction works encroach upon areas susceptible to earthquakes. Earthquake research efforts have been intensified, and special studies of such earthquake-prone zones as the San Andreas Fault in California by geologists, geophysicists, and seismologists are yielding new insights into the nature and mechanisms of earthquakes which, hopefully, will make earthquake prediction possible, and which certainly will increase man's ability to live safely in earthquake zones.

As a result of legislation recommended by the Joint Committee on Seismic Safety of the California Legislature, and enacted in 1971, a Seismic Safety Element is now required as a part of General Plans. The effect of this law is to require cities and counties to take seismic hazards into account in their planning programs and decisions. The basic objective is to reduce loss of life, injuries, damage to property, and economic and social dislocations resulting from future earthquakes.

The Seismic Safety Element has been prepared and adopted as a separate publication, to explain the mechanics of earthquakes, to point out possible dangers - in general, as well as in our County -, to identify all hazards known to us at this time, and to adopt prevention and emergency measures.

The County of Merced has been very fortunate in the past. It has not suffered loss of lives, and great property damage was caused only during the 1906 San Francisco earthquake. This fact tends to make people believe that there is not much danger for our area in the future either, however, this is a great mistaken assumption. As earthquake research continues and progresses, we are becoming aware that a disaster in our community is not at all impossible.

A. What causes Earthquakes ?

Earthquakes are caused by movement of crustal material, as the rocks of the earth adjust to tectonic forces. Recent conclusions derived from interpretation of geologic data - gathered primarily from the ocean floors - indicate that the surface of the earth is composed of a number of more or less rigid plates. These plates are "floating" on a plastic zone of rock material. The frequency of earthquakes is highest where two plates are being pushed against each other, or where one plate is overriding another.

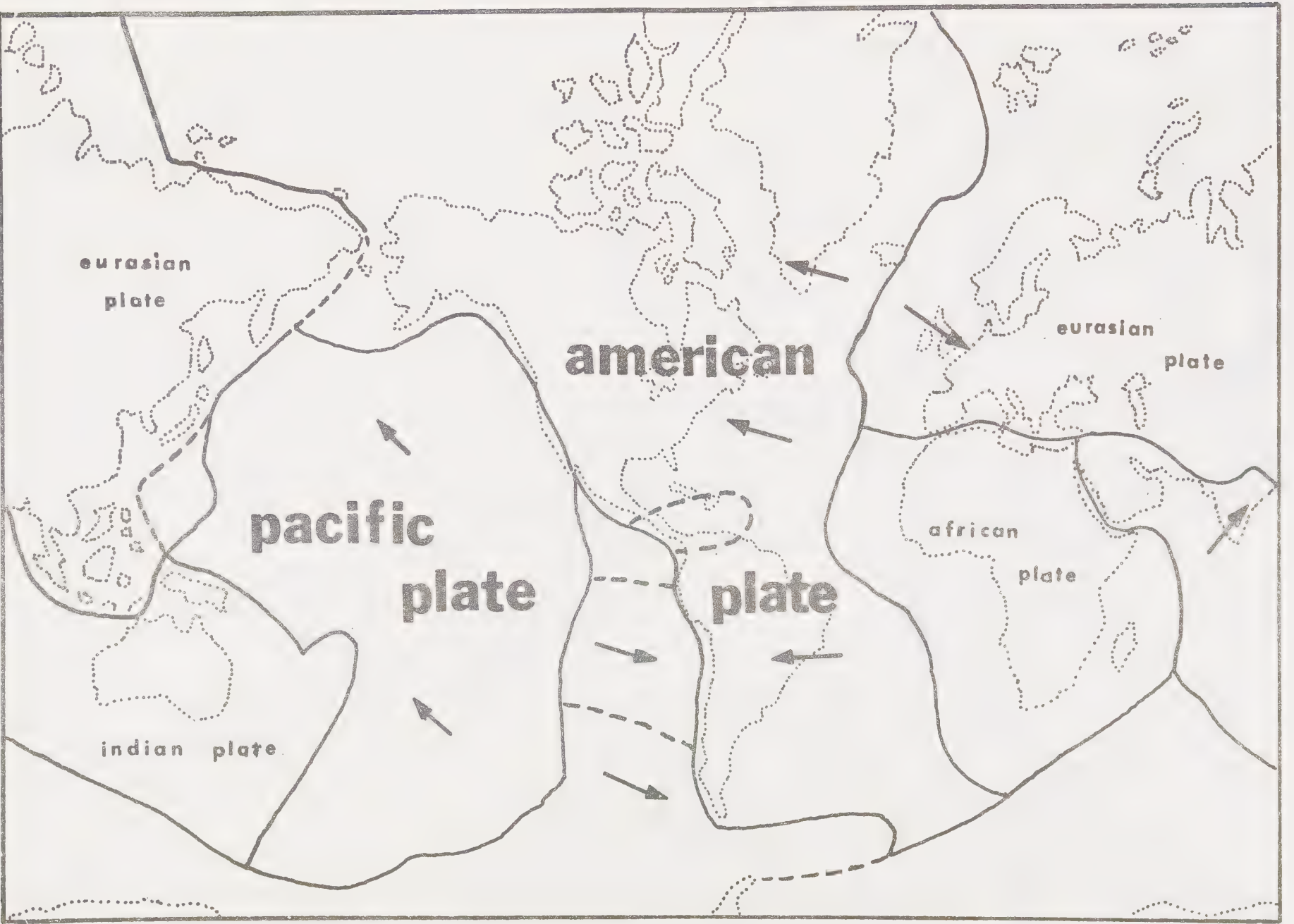
Page B-3 shows the distribution of major rigid plates, relatively free from earthquakes, bordered by active belts characterized by earthquakes. (Page B-4).

The American Plate includes both, North and South America, and extends from the Mid-Atlantic ridge to the western coast of both of the continents. The San Andreas Fault is a part of the western boundary of the American Plate, according to most geologists. The crustal material west of the San Andreas Fault is a part of the Pacific Plate, which is moving to the north-west. The stresses build up in the rocks as these plates are pushed into each other, then are released when the strength of the rock is exceeded, and the result is an earthquake.

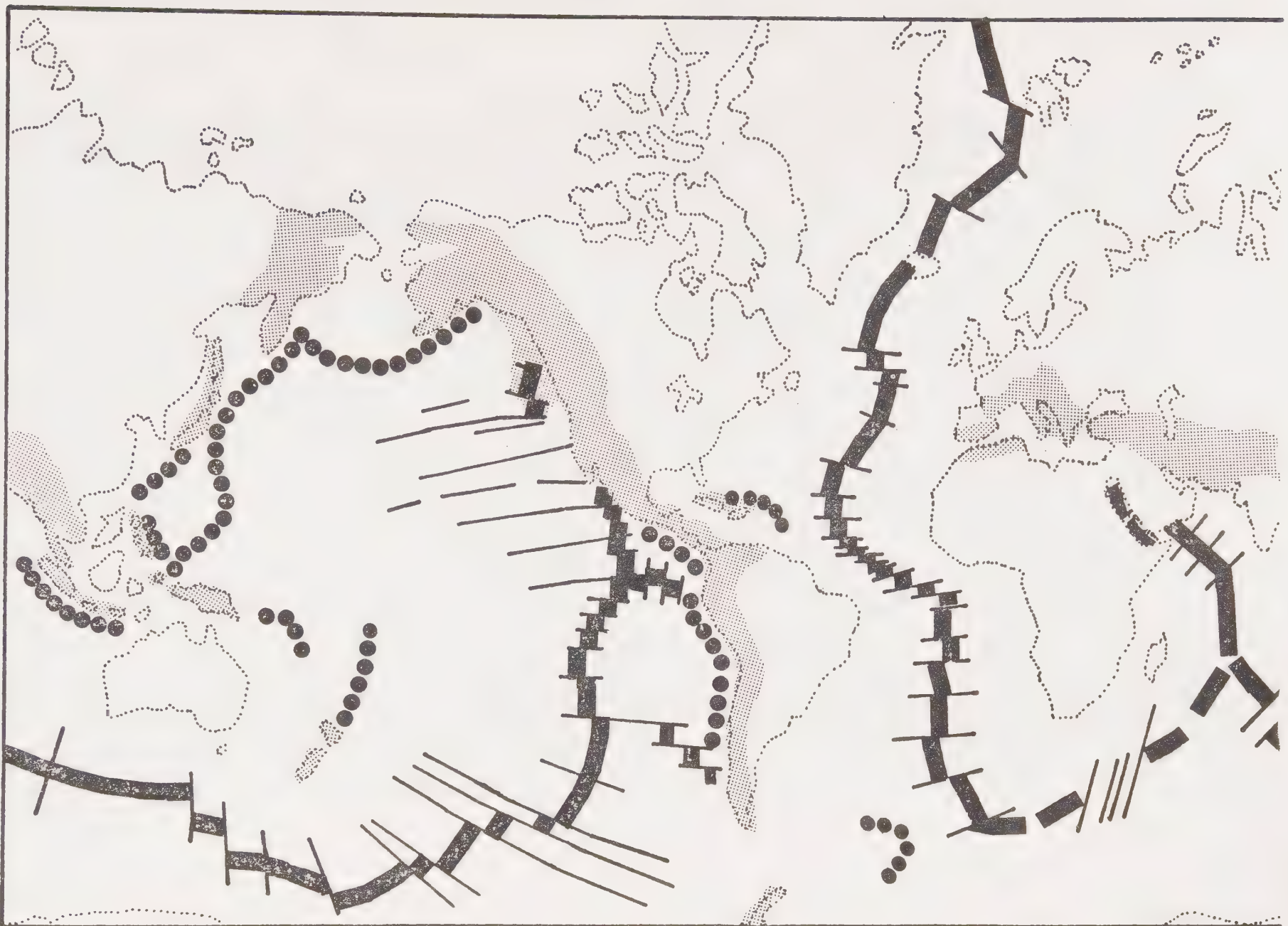
As terrifying as these movements are, they are clearly to be expected in California. The State's location on the circum-pacific seismic belt assures that it will be shaken again and again by earthquakes, as the crust adjusts itself to changing stress.

B. Measuring Earthquakes

The very size and strength of an earthquake is difficult to express in common terms. Some people have compared the force expended by a great earthquake to the force of 100,000 atomic bombs. But this comparison has very little real meaning, since



Source: Encyclopaedia Britannica



Source: *Encyclopaedia Britannica*

active
mountain
belts

ocean
trenches

submarine
ridges

Fault
Zones

the force of even one such explosive is difficult to comprehend. The 1906 earthquake which was the largest in California for which we have extensive records, its energy is often estimated. Two frequently quoted comparisons state that the energy released during that single quake was equal to the force needed to raise a cubic mile of rock 6,000 feet, or run a battleship at full speed for 45,000 years. Since both of these conditions are hypothetical, they provide no real clue. It seems enough to say that an earthquake is one of the most irresistible forces on earth, and that it is impossible to attach any comparable numerical value on a force that can cause "solid" earth to shift twenty feet.

Earthquakes can be measured in terms of either energy (magnitude), or actual effects (intensity). The first measurement is based on instrument records, the second on personal observations. They are completely separate in intent and results, but they are often confused by the general public. An earthquake that is centered in a densely populated area, and which kills dozens of people and levels a city, may have exactly the same magnitude as an earthquake far out in the desert that does nothing more than raise a cloud of dust and frighten a few rabbits.

1. The Richter Magnitude Scale

The Richter Magnitude Scale was first used in 1935. Past records have made it possible to assign magnitudes to major earthquakes as far back as 1904.

Magnitudes are expressed in whole numbers and decimals from 1.0 to 10.0, usually between 3 and 8. The maximum amplitude of earthquake waves recorded on the seismogram is transformed to a numerical figure by means of a logarithmic scale. This means that an increase of a whole number on the scale represents a tenfold increase in the size of the earthquake record.

The record written by an earthquake of 8.3 magnitude is not twice that of a shock of 4.3 magnitude, but 1,000,000 times as great.

Energies of Earthquakes

<u>Earthquake Magnitude</u>	<u>Approximate Earthquake Energy</u>	
1.0	6 ounces	T.N.T.
1.5	2 pounds	T.N.T.
2.0	13 pounds	T.N.T.
2.5	63 pounds	T.N.T.
3.0	397 pounds	T.N.T.
3.5	1,990 pounds	T.N.T.
4.0	6 tons	T.N.T.
4.5	32 tons	T.N.T.
5.0	199 tons	T.N.T.
5.5	1,000 tons	T.N.T.
6.0	6,270 tons	T.N.T.
6.5	31,550 tons	T.N.T.
7.0	199,000 tons	T.N.T.
7.5	1,000,000 tons	T.N.T.
8.0	6,270,000 tons	T.N.T.
8.5	31,550,000 tons	T.N.T.
9.0	199,000,000 tons	T.N.T.

The Richter Scale has no fixed maximum, however, observations have placed the largest known earthquakes in the world at the 8.8 or 8.9 level.

2. Earthquake Intensities

In a typical field study experts gather as much information as possible about a given quake from questionnaires sent out to people within the affected area, and from on-the-spot study. After considering all the evidence, the experts decide which of the twelve degrees of intensity of the Modified Mercalli Scale would best apply to this or that place; the figure is then entered on a map. After the map has a good many entries of this sort, a line is drawn through the points showing the highest number on the scale of intensity. Then another line is drawn through the places showing the highest number, and so on. These lines, which generally form a series of closed con-

URBAN GEOLOGY MASTER PLAN
California Division of Mines & Geology

Modified Mercalli scale of earthquake intensities.

THE MERCALLI INTENSITY SCALE

(As modified by Charles F. Richter in 1956 and rearranged)

*If most of these effects
are observed*

*then the
intensity is:*

*If most of these effects
are observed*

*then the
intensity is:*

Earthquake shaking not felt. But people may observe marginal effects of large distance earthquakes without identifying these effects as earthquake-caused. Among them: trees, structures, liquids, bodies of water sway slowly, or doors swing slowly.

I

Effect on people: Difficult to stand. Shaking noticed by auto drivers.

Other effects: Waves on ponds; water turbid with mud. Small slides and caving in along sand or gravel banks. Large bells ring. Furniture broken. Hanging objects quiver.

Effect on people: Shaking felt by those at rest, especially if they are indoors, and by those on upper floors.

II

Structural effects: Masonry D* heavily damaged; Masonry C* damaged, partially collapses in some cases; some damage to Masonry B*; none to Masonry A*. Stucco and some masonry walls fall. Chimneys, factory stacks, monuments, towers, elevated tanks twist or fall. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Decayed piling broken off.

VIII

Effect on people: Felt by most people indoors. Some can estimate duration of shaking. But many may not recognize shaking of building as caused by an earthquake; the shaking is like that caused by the passing of light trucks.

III

Effect on people: General fright. People thrown to ground.

Other effects: Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes. Steering of autos affected. Branches broken from trees.

Other effects: Hanging objects swing.

Structural effects: Windows or doors rattle. Wooden walls and frames creak.

IV

Structural effects: Masonry D* destroyed; Masonry C* heavily damaged, sometimes with complete collapse; Masonry B* is seriously damaged. General damage to foundations. Frame structures, if not bolted, shifted off foundations. Frames racked. Reservoirs seriously damaged. Underground pipes broken.

IX

Effect on people: Felt by everyone indoors. Many estimate duration of shaking. But they still may not recognize it as caused by an earthquake. The shaking is like that caused by the passing of heavy trucks, though sometimes, instead, people may feel the sensation of a jolt, as if a heavy ball had struck the walls.

V

Other effects: Hanging objects swing. Standing autos rock. Crockery clashes, dishes rattle or glasses clink.

Structural effects: Doors close, open or swing. Windows rattle.

Effect on people: General Panic.

Other effects: Conspicuous cracks in ground. In areas of soft ground, sand is ejected through holes and piles up into a small crater, and, in muddy areas, water fountains are formed.

Structural effects: Most masonry and frame structures destroyed along with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes and embankments. Railroads bent slightly.

X

Effect on people: Felt by everyone indoors and by most people outdoors. Many now estimate not only the duration of shaking but also its direction and have no doubt as to its cause. Sleepers awakened.

Other effects: Hanging objects swing. Shutters or pictures move. Pendulum clocks stop, start or change rate. Standing autos rock. Crockery clashes, dishes rattle or glasses clink. Liquids disturbed, some spilled. Small unstable objects displaced or upset.

Structural effects: Weak plaster and Masonry D* crack. Windows break. Doors close, open or swing.

VI

Effect on people: General panic.

Other effects: Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land.

Structural effects: General destruction of buildings. Underground pipelines completely out of service. Railroads bent greatly.

XI

Effect on people: Felt by everyone. Many are frightened and run outdoors. People walk unsteadily.

Other effects: Small church or school bells ring. Pictures thrown off walls, knickknacks and books off shelves. Dishes or glasses broken. Furniture moved or overturned. Trees, bushes shaken visibly, or heard to rustle.

Structural effects: Masonry D* damaged; some cracks in Masonry C*. Weak chimneys break at roof line. Plaster, loose bricks, stones, tiles, cornices, unbraced parapets and architectural ornaments fall. Concrete irrigation ditches damaged.

VII

Effect on people: General panic.

Other effects: Same as for Intensity X.

Structural effects: Damage nearly total, the ultimate catastrophe.

Other effects: Large rock masses displaced. Lines of sight and level distorted. Objects thrown into air.

XII

*Masonry A: Good workmanship and mortar, reinforced, designed to resist lateral forces.

Masonry B: Good workmanship and mortar, reinforced.

Masonry C: Good workmanship and mortar, unreinforced.

Masonry D: Poor workmanship and mortar and weak materials, like adobe.

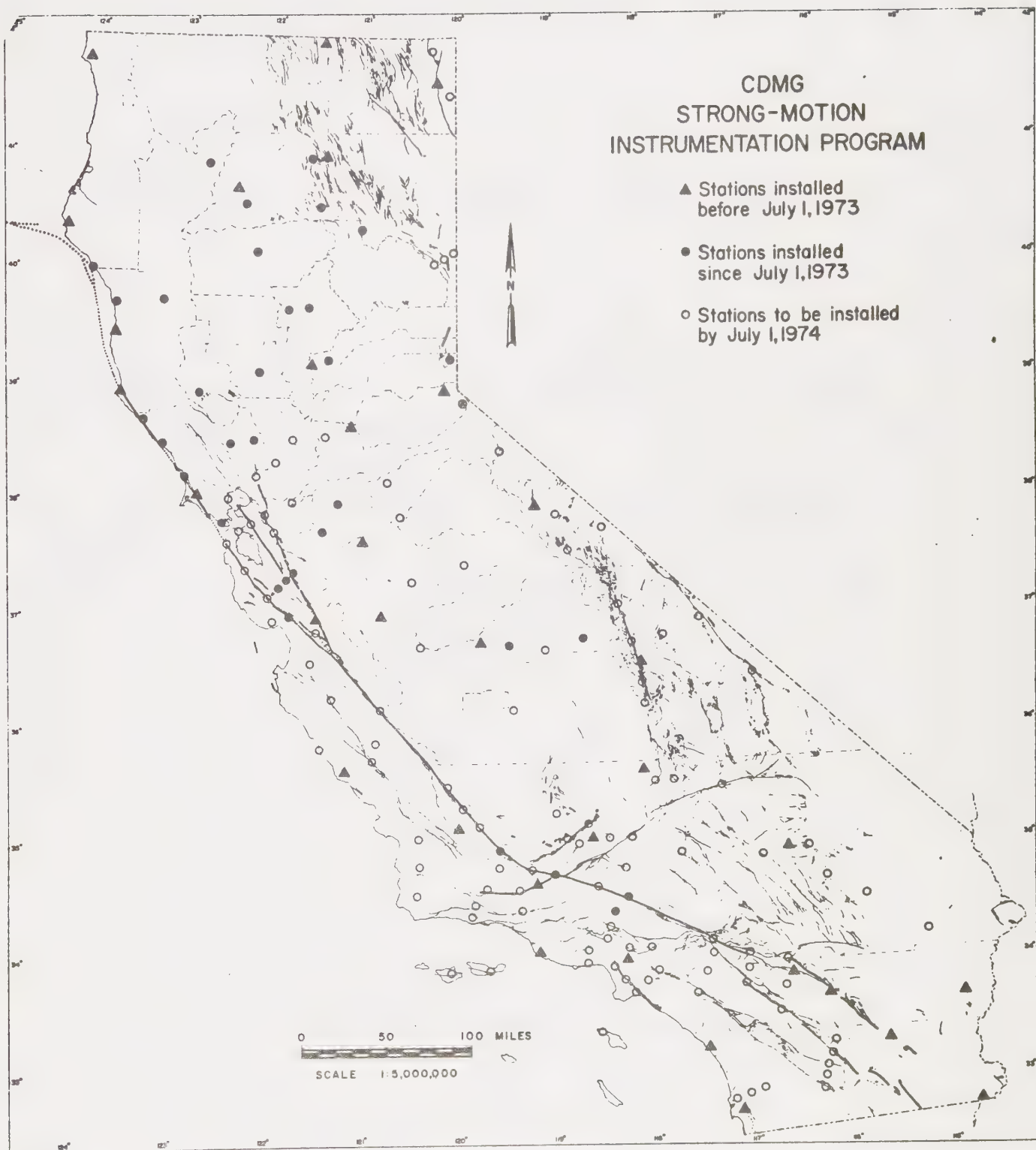
centric curves, are called isoseismal lines. Within the innermost of these lines the experts will determine the epicenter of the quake with a considerable degree of accuracy.

The field study of earthquakes is often impossible. Obviously, it could not be applied to quakes occurring at sea. Even in regions where there is an adequate number of witnesses, the results may be unsatisfactory. Those near the center of the disturbance may have been so unnerved at the time, that they cannot give a clear account of what they saw or felt. Farther away from the epicenter, the vibrations of the earth may be so faint that an unskilled witness may not be able to describe them accurately.

Intensity ratings are based on visual observation, they are not measured with instruments.

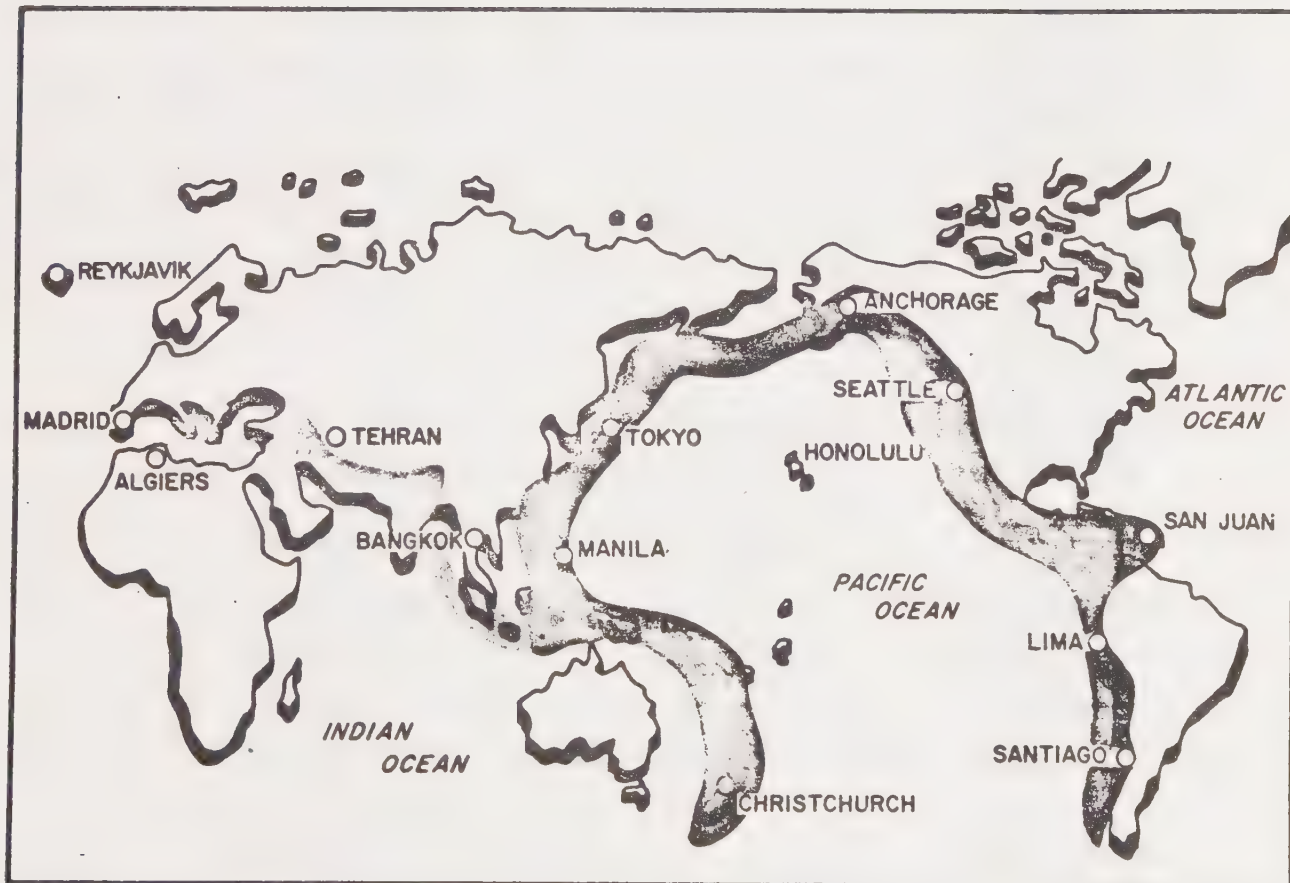
3. California's Strong-Motion Program

Seismographs, which register the magnitude of an earthquake, are located near San Luis Reservoir. Seismometers and transmitting equipment are located in a concrete vault north of Pacheco Pass on State Highway 152. Accelerographs, also known as "strong-motion seismograph", are supposed to be stationed in Merced County by July 1974, one near Los Banos, and one in the Merced area. These accelerographs are designed to measure the behavior of the ground during earthquakes nearby. Since the San Fernando Valley quake, February 1971, scientists have learned much about liquefaction of unconsolidated sediments during seismic groundshaking. If seismic design standards have been enforced during building construction, major damage can be avoided. If the structures are not safe, even a distant earthquake can be disastrous. The 1971 California Legislature therefore enacted, and the Governor signed into law the state-wide "strong-motion instrumentation program". The California Division of Mines and Geology is carrying out the provisions of this law, which is being financed through a surcharge on building permits: the applicant has to pay 7¢ per \$ 1,000 worth of construction.



Locations of strong-motion accelerograph stations installed and soon to be installed under the State Strong-Motion Instrumentation Program.

Source: California Geology, CDMG, Feb. 1974



Source: California Geology, November 1971

The circum-Pacific seismic belt follows the edge of the Pacific Ocean basin. It is along this belt that 80 per cent of the world's earthquakes take place. The State of California is part of this belt.

C. Seismic Activity in the State of California

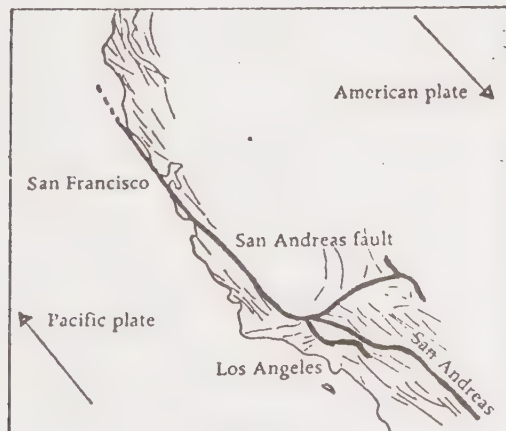
The State of California is known as "Earthquake Country". Earthquakes are part of the state's heritage, and those who reside here must learn to live with them. According to the California Division of Mines and Geology, the historical record of quakes in the state began in 1769, when Gaspar de Portola's expedition was shaken by a large earthquake while camped near the Santa Ana River. The heavy shaking reportedly threw the river out of its channel, and many men and horses were knocked to the ground. Few detailed records were kept of earthquakes in California until after 1850, when the state's population began to grow rapidly. By the turn of the century studies were more detailed, especially the 1906 earthquake in San Francisco provides us with detailed documents.

California is located on the Circum-Pacific Seismic Belt, where 80 per cent of the world's earthquakes occur. The San Andreas Fault system, the most active of California's faults, forms the boundary between two crustal plates, the American Plate and the Pacific Plate. The Pacific Ocean and that part of California to the west of the San Andreas Fault are moving slowly in northwesterly direction with respect to the rest of the American continent. This location assures us, that the state will be shaken again and again by earthquakes, as the crust adjusts itself to changing stress. California is hit by thousands of shocks every year, some 500 of which are large enough to be felt by many people. Other parts of the belt, such as the Aleutian Islands, Japan, and the Melanesian Islands, have more frequent earthquakes than California, but - for the past 60 years - destructive earthquakes have occurred in California on the average of about one every two years.

Questioned, how often earthquakes can be expected to occur in our state, Dr. Robert Wallace, Assistant Chief Geologist of the

U.S. Geological Survey in Menlo Park, said (with regard to the San Andreas Fault alone):

"At the present time we can make only generalized predictions about the occurrence of major earthquakes along the San Andreas Fault zone, based on past performances of the faults. For example, analysis of the record of seismic activity suggests that two successive magnitude 6 earthquakes somewhere along the San Andreas Fault would occur every 5 years, that the interval for magnitude 7 quakes is 15 years, and that earthquakes of magnitude 8 might be expected at intervals of about 100 years."



The San Andreas Fault, California, bounding the American and Pacific Plates. The continent is shattered in a host of associated faults.

SIGNIFICANT FAULTS IN CALIFORNIA

SAN ANDREAS FAULT is the most publicized rift in California. It is by far the longest in the state, and it annually produces dozens of earthquakes. But despite its importance, the role of the San Andreas is often exaggerated; it is frequently blamed for every earthquake in California, and many people believe that once they move away from this great fault, they no longer need to fear earthquakes—a dangerous fallacy.

HAYWARD FAULT, despite its distinctive name, is really a branch of the San Andreas zone. The fault has played a significant role in the geologic development of the San Francisco Bay area, and it has also given birth to several large tremors.

CALAVERAS, an extremely active fault

SIERRA NEVADA FAULT movements have created the magnificent escarpment that forms the eastern edge of the Sierra. The Owens Valley branch of the system was responsible for the 1872 quake—the largest in California's recorded history.

WHITE WOLF FAULT is a short, relatively insignificant fault that taught Californians a lesson in 1952, when it unexpectedly generated the greatest earthquake to hit California since 1906. Unimpressive size and apparent inactivity can be very deceiving.

GARLOCK FAULT is the second largest fault in the state, and has made several contributions to the landscape, including the mountain ranges that form the northern edge of the Mojave Desert. Strangely enough, there has not been a single great earthquake during recorded history that can be blamed on this huge fracture.

SANTA YNEZ FAULT is the largest of a group of related breaks that form a large seismic area around the Santa Barbara channel. The most spectacular earthquake to originate in this region was the 1925 Santa Barbara shock.

NEWPORT-INGLEWOOD FAULT was unknown until 1920, when a small earthquake told seismologists that there was an active break along the coast. If there were any doubts about activity, they were dispelled in 1933, when the disastrous Long Beach quake rattled the coast.

ELSINORE FAULT has been instrumental in the development of many mountain ranges and valleys near the southern coast. However, earthquake activity during the past 150 years has been insignificant.

SAN JACINTO FAULT is part of the San Andreas zone—indeed, it may be the most active branch. It has been the source of many important quakes, and the land forms along its route give mute testimony to its long-term significance on the state's topography.

IMPERIAL FAULT is another branch of the San Andreas zone. Exact route of the fault was not exposed until the 1940 earthquake which ruptured the surface on both sides of the U.S.-Mexico border.



Source: EARTHQUAKE COUNTRY, R. Iacopi

Floods



VI. Floods

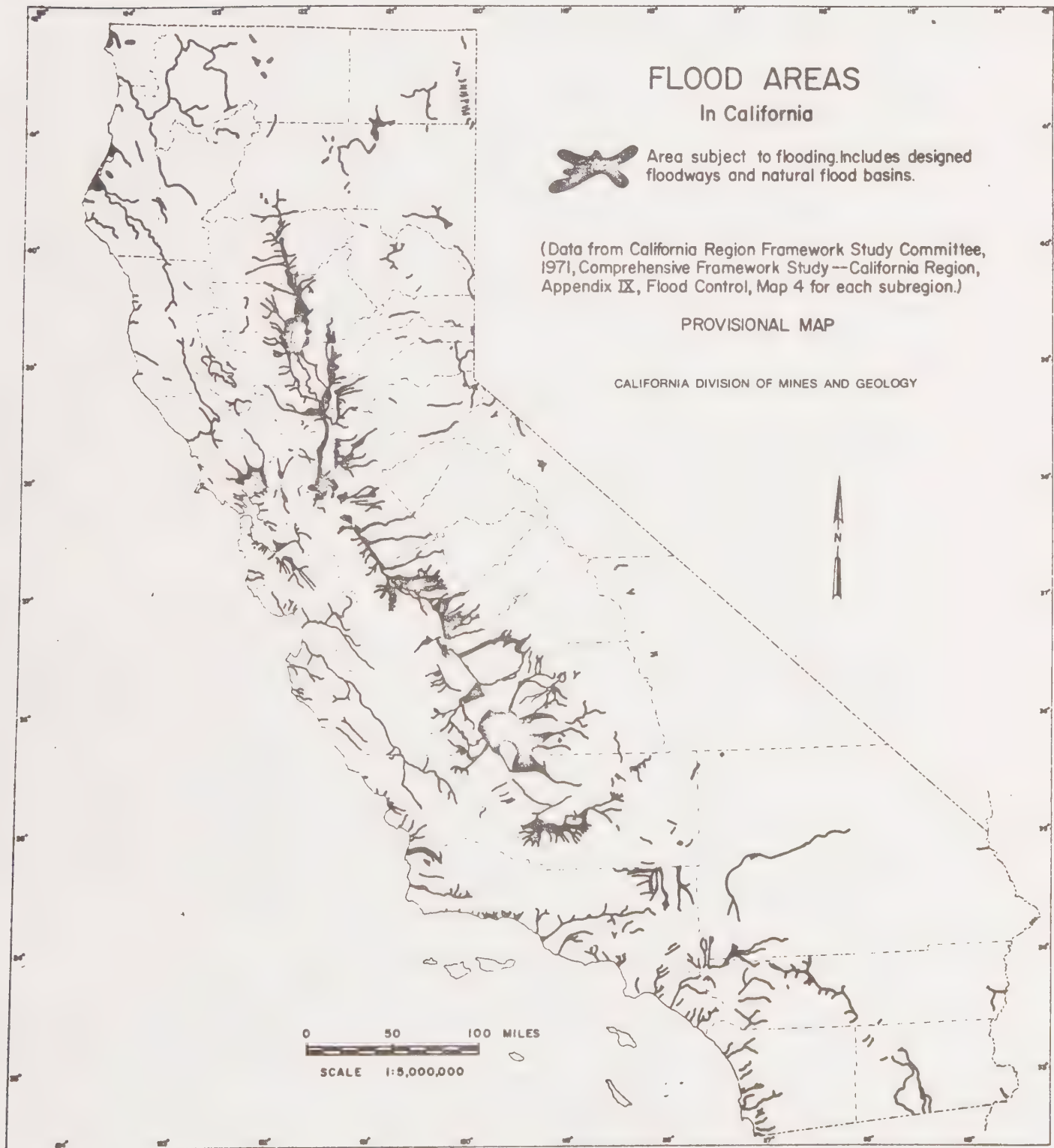
The flood plains of rivers and streams were formed by nature as drainage channels for flood flows resulting from heavy snowmelt or rainfall. Prior to man there were floods, but no flood problems. A local flood problem usually began with the construction of a single structure in a flood plain area, either at a level below flood heights or without regard to the effect of the structure upon flood-flows. This initial development tended to establish patterns for similar agricultural, residential, commercial, or industrial construction. As private and public developments expanded over the flood plain, flood heights and velocities increased and the economic losses multiplied. Historically, man has undertaken large-scale works (reservoirs, channel enlargements, flood walls, levees, etc.), to prevent or reduce the natural extend of flood inundation. This approach has only been partly effective, because communities have grown rapidly not only in the flood plain areas protected by public-works facilities, but also in the unprotected areas.

A. Floods in California

Flooding is one of the costliest natural hazards in California. National statistics show that California ranks as one of the major flood problem areas in the nation, and that flooding is one of the principal factors to be considered in the overall development and use of land resources. Numerous programs have been implemented for reducing flood losses, structural and non-structural, some directed at preventing floods, others at controlling those that cannot be prevented.

1. Structural Flood-Control Measures

Structural measures include flood-water storage systems such as dams, reservoirs, and the construction of related facilities such as levees and channel developments. Watershed management is very important to reduce runoff, debris movement, erosion and sedimentation.



2. Non-Structural Measures

Non-structural measures include flood forecasting, zoning and subdivision regulations, the exclusion of use in primary floodways, building code requirements and restriction of certain developments in flood areas.

For many agricultural and developed urban areas, structural measures only are feasible. For newly proposed developments, however, non-structural measures appear more effective.

B. Floods in the County of Merced

The County of Merced, due to its location between two mountain ranges, has a long history of flooding. It is subject to two types of floods: 1. those that occur during late fall and winter months, primarily as a result of prolonged rainstorms in the mountains and on the valley floor; and 2. those that occur during the spring and early summer months as a result of the melting of the winter snow-pack in the high areas of the Sierra Nevada. Annual precipitation in the San Joaquin Valley varies from about 5 inches on the valley floor, to over 70 inches in the Sierra Nevada range. The mean annual runoff ranges from about 40 inches at the higher altitudes in the east, to less than $\frac{1}{2}$ inch in the valley. The streams draining areas of high altitudes in the east have most of their runoff as snowmelt, with almost 60 % of it generally occurring during the months of April through June. The streams draining the Coast Ranges and the foothills of the Sierra Nevada have most of their runoff immediately following the storms of winter and early spring, with the result that about 90 % of the runoff occurs in the months December through April.

1. Flood-Control Measures in our Community

Extensive flood control improvements have been undertaken in this County, that have greatly reduced the flood-prone areas. Besides many miles of levees and channel improvements, the following reservoirs have been constructed

inside Merced County boundaries:

San Luis Reservoir

Capacity: 2,100,000 acre-feet

O'Neill Forebay

Capacity: 57,000 acre-feet

Los Banos Creek Reservoir

Capacity: 34,500 acre-feet

Burns Reservoir

Capacity: 30,000 acre-feet

The following reservoirs are located in Mariposa County, controlling our streams:

Exchequer Reservoir (Lake McClure)

Capacity: 1,024,600 acre-feet

Lake McSwain Reservoir

Capacity: 9,730 acre-feet

Bear Creek Reservoir

Capacity: 7,700 acre-feet

Owens Creek Reservoir

Capacity: 3,600 acre-feet

Mariposa Creek Reservoir

Capacity: 15,000 acre-feet

As effective as the existing flood control measures have been to reduce flood flows and resulting damage, flood problems still exist in some areas. The following proposed enlargement of existing reservoirs, and construction of new dams that will control streams through our County, should reduce flood damage considerably:

Montgomery Reservoir (Merced River)

Capacity: 45,000 acre-feet

Bagby Reservoir (Merced River)

Capacity: 350,000 acre-feet

LEGEND

- RAIL ROAD
- HIGHWAYS
- PERENNIAL STREAM
- INTERMITTENT STREAM
- LEVEE
- COUNTY LINE
- DRAINAGE BOUNDARY
- 50 YEAR FLOOD
- INTERMEDIATE REGIONAL FLOOD
- STANDARD PROJECT FLOOD
- EXISTING RESERVOIR
- PROPOSED PROJECT RESERVOIR
- CANAL
- PRECIPITATION STATION



SCALE IN MILES

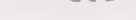
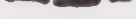
MERCED COUNTY, CALIFORNIA

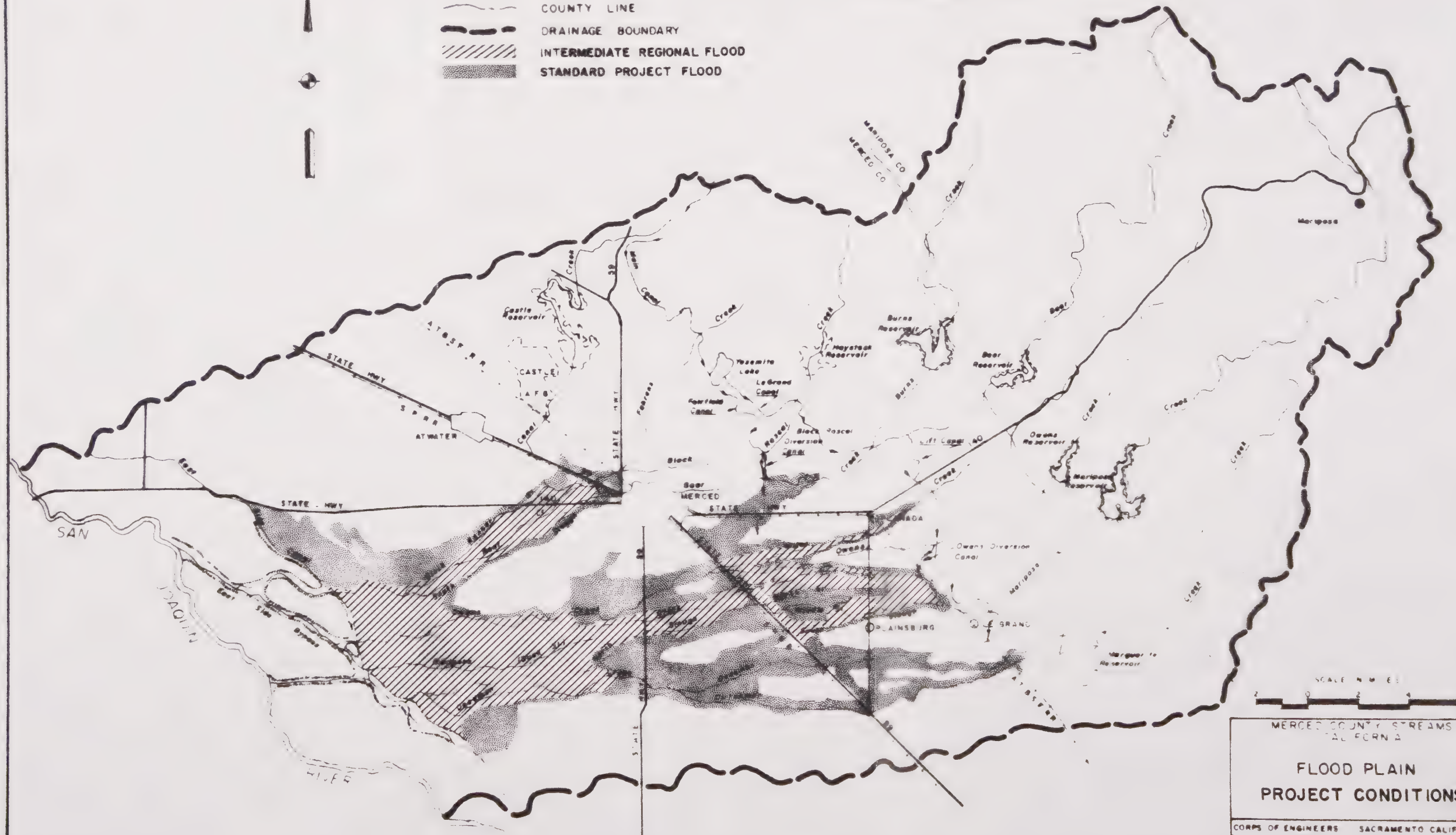
FLOOD PLAIN
EXISTING CONDITIONS

CORPS OF ENGINEERS SACRAMENTO CALIFORNIA

Date: October 1968

LEGEND

-  RAILROAD
-  HIGHWAYS
-  PERENNIAL STREAM
-  INTERMITTENT STREAM
-  LEVEE
-  COUNTY LINE
-  DRAINAGE BOUNDARY
-  INTERMEDIATE REGIONAL FLOOD
-  STANDARD PROJECT FLOOD
-  EXISTING RESERVOIR
-  PROPOSED PROJECT RESERVOIR
-  CANAL
-  PRECIPITATION STATION



SCALE IN MILES
0 1 2 3 4 5

MERCED COUNTY STREAMS
CALIFORNIA

FLOOD PLAIN
PROJECT CONDITIONS

CORPS OF ENGINEERS SACRAMENTO CALIFORNIA

Date October 1968

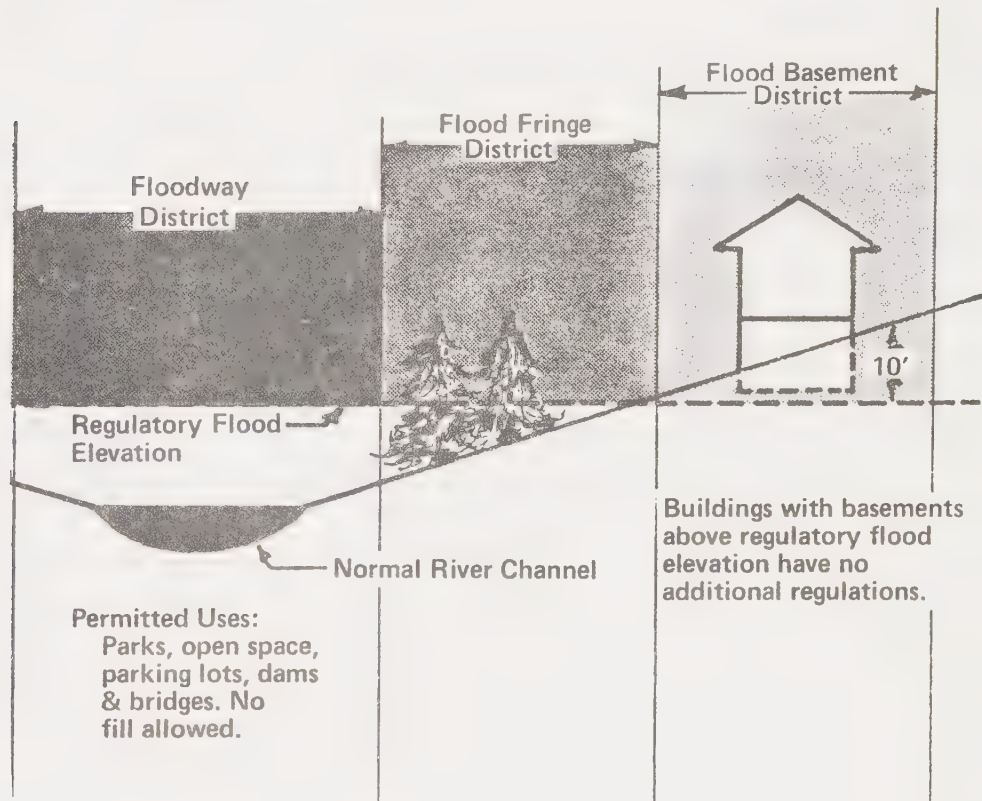
C. Flood Disaster Protection Act of 1973

The federal government had to hand out billions in grants and loans to help victims of storms and hurricanes. Voluntary flood insurance laws of 1968 and 1969 had few incentives for the purchase of federal flood insurance, or for communities to zone for flood-proofing of structures and utilities in flood-prone areas. In fact, undeveloped lowland tended to be less expensive, encouraging land developers and builders to move in. Prospective buyers counted on Washington to bail them out with grants and loans if and when floods came. Many flooded-out owners were better off financially after a disaster than before, according to a new study done for the American Enterprise Institute by Howard Kunreuther of Philadelphia's Wharton School of Finance and Government.

President Nixon signed the "Flood Disaster Protection Act of 1973" on December 31, 1973, which forces homeowners in flood plain areas to buy federal flood insurance, and so reduce the multi-billion-dollar drain on the Treasury for grants to flood victims. In addition, the new law requires local governments to adopt tough zoning ordinances for their flood-prone areas. There are provisions in the Act that shut off mortgage money in the flood-prone areas, unless their communities join the program. If the communities don't pass land-use controls that meet federal standards, buyers of homes and commercial properties won't get federal flood insurance. If the buyers can't buy insurance, no bank or savings and loan company regulated by a federal agency will be allowed to finance either the construction or purchase of a building in the flood-prone area. Approximately 10,000 communities are to get notified by the Federal Insurance Administration of the Department of Housing and Urban Development, HUD, that they have flood-prone areas within their boundaries. The local government then has to adopt strict regulations for their flood plains, have preliminary maps showing approximate boundaries, and meet other requirements before they become eligible

for insurance coverage at subsidized rates.

The unincorporated area of Merced County qualified for this Regular Flood Insurance Program, which was certified on May 9, 1973. The 50 and 100 year floodplains are being established now, and will be published before the deadline , with detailed instructions to the homeowners effected. Ordinance No. 586, "Flood Plain Land Use Ordinance", has been adopted by the Merced County Board of Supervisors on August 5, 1969, and is quoted on pages F-8 through F-15.



Source: ASPO, PAS Report

Flood Fringe: also known as "Primary Flood Plain"
or "50-Year Flood Plain"

Flood Basement District: also known as "Secondary Flood Plain"
or "100-Year Flood Plain"

ORDINANCE NO. 586

- Flood Plain Land Use Ordinance -

An Ordinance establishing a Primary Flood Plain Area and a Secondary Flood Plain Area and enumerating certain permissible land uses and regulations relative thereto within the County of Merced, and declaring this Ordinance to be necessary for the preservation of the public health, safety, peace, and general welfare, and prescribing penalties for the violation of its provisions.

The Board of Supervisors of the County of Merced, State of California, do hereby ordain as follows:

SECTION I - PURPOSE OF ORDINANCE

The purpose of this Ordinance is to provide for the control and regulation of land use and structures within the various water sheds and their flood plain areas.

Said flood plain areas will be defined and their boundaries shown upon maps and said maps to be accordingly named and identified.

The aforesaid maps will hereafter be attached and then made a part of this Ordinance, being designated as "Flood Plain Zone Maps" and said maps and all the notations, references, and other information shown thereon shall be as much a part of this ordinance as if the matters and information set forth by said maps were fully described herein.

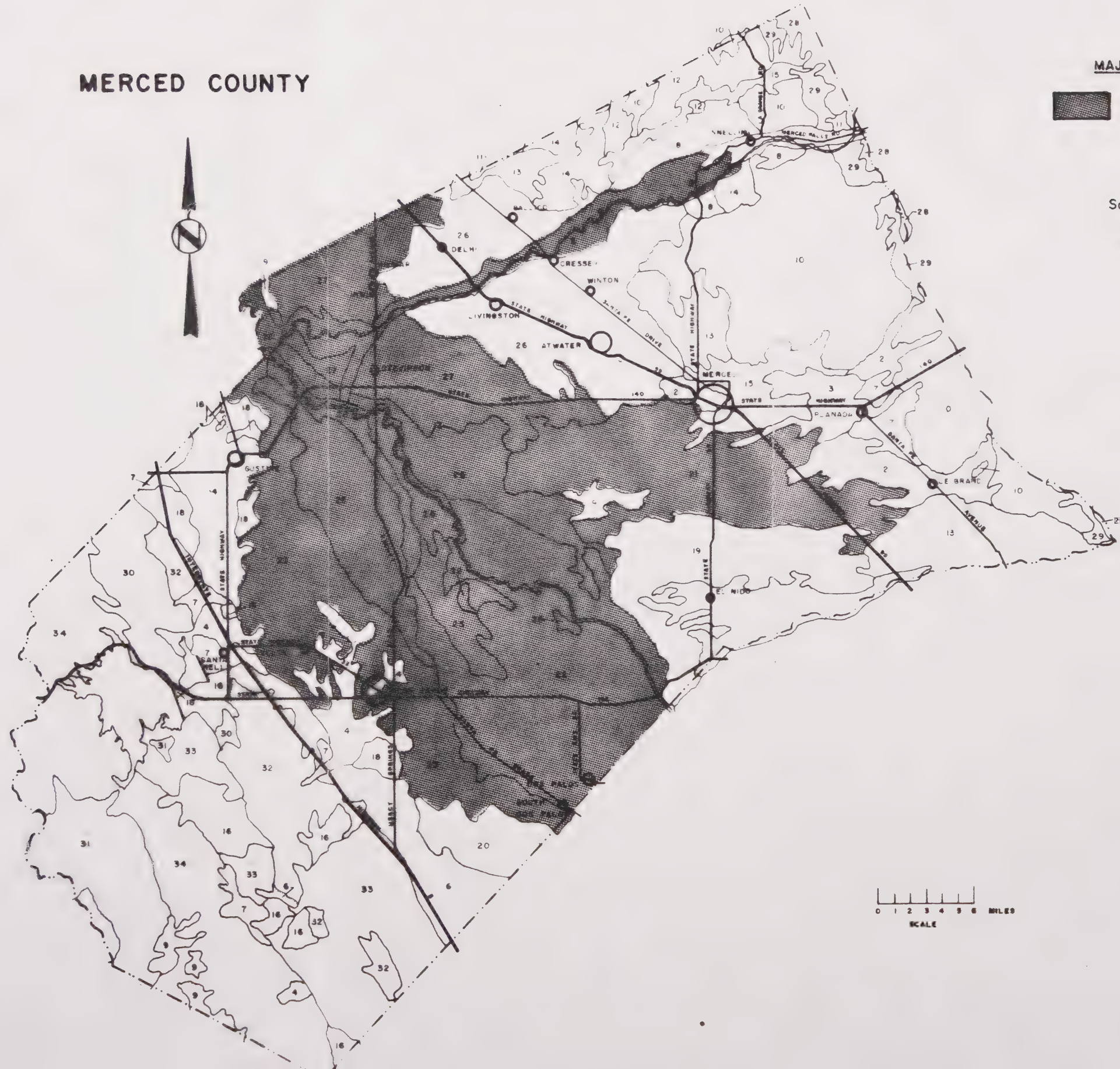
Before the adoption of any Flood Plain Zone Map, two public hearings will be held in the same manner as for the adoption of zone maps as provided for in the County Zoning Ordinance and the State Planning Act.

MERCED COUNTY

MAJOR SOIL PROBLEM

 WETNESS

Source:
U. S. Dept. of Agriculture,
Soil Conservation Service



Definitions:

- A. Floodway: The channel of a stream and the adjacent land required to adequately accomodate flood waters of the selected flood.
- B. Selected Flood: The magnitude of a flood to be used for determining and establishing minimum flood profile levels to designate the outer limits of the flood plain to be regulated.
- C. Primary Flood Plain Area: Land located within and adjacent to the primary floodway and which is subjected to periodic flooding caused by heavy and/or prolonged runoff, and where any encroachment of structures would endanger life or significantly restrict the carrying capacity of a floodway.
- D. Secondary Flood Plain Area: Land located adjacent to the Primary Flood Plain Area which is subjected to periodic flooding caused by heavy and/or prolonged runoff, and where it is necessary to restrict and control land and uses in relation to flood hazard.

SECTION II - REGULATIONS

The following uses are permitted provided there are no improvements or disturbances of natural soils that may tend to cause erosion or any other conditions that may adversely effect the efficiency of the channel or floodway.

A. Primary Flood Plain Area

The following regulations shall apply in the Primary Flood Plain Area: (Land located within and adjacent to the floodway and which is subjected to periodic flooding caused by heavy and/or prolonged runoff.)

1. Uses Permitted

1. Field Crops
2. Permanent Pasture
3. Stock Raising
4. Recreation Areas
5. Wildlife Preserves

Any uses other than those listed must be applied for to the County Planning Commission.

No dividing or subdividing of land for residential purposes shall be permitted.

The construction, erection, or placement of any structure for human habitation is strictly prohibited.

B. Secondary Flood Plain Area

The following regulations shall apply in the Secondary Flood Plain Area: (Land subjected to periodic flooding caused by heavy and/or prolonged runoff.)

1. Uses Permitted

1. Field Crops
2. Permanent Pasture
3. Stock Raising
4. Orchards
5. Vineyards
6. Recreation Areas
7. Parks
8. Golf Courses
9. Wildlife Preserves
10. Public Service Facilities

2. General Uses Permitted

1. One single-family dwelling per parcel, providing however, that the following enumerated construction conditions are met:

- a. Foundation walls, footing, and piers be so constructed as to withstand flood conditions.
- b. The dwelling must be firmly attached to its foundation so that it cannot become detached during flood conditions.
- c. The dwellings main floor level shall not be lower than 6" above the elevation as selected for the flood of record as defined on the Flood Plain Zone Map.

3. The Planning Commission may approve other uses that are compatible to those listed under 1. or 2. of Section II, where such uses would not endanger life or property and not be an obstruction to the free flow of water during flood conditions.
4. No dividing or subdividing of land for residential purposes shall be permitted.

SECTION III - AREA REQUIREMENTS

The minimum building site area for a one-family dwelling shall be ten thousand (10,000) square feet.

SECTION IV - BUILDING HEIGHT

The maximum building height for residential use shall be two (2) stories.

SECTION V - PERMITS

- A. A Building Permit is required for any construction.
- B. A Land Use Permit Application is required to be filed with the Planning Commission for any use or construction not herein listed.

Land Use Permits are revocable if conditions of the Permit are violated and are not corrected within such prescribed time as set forth in the notice of violation.

SECTION VI - APPEALS

- A. Any person, firm, or corporation not satisfied with the action of the Planning Commission in connection with a Land Use Application or of conditions imposed upon a Land Use Permit, may appeal to the Board of Supervisors of the County of Merced.

The appeal must be in writing stating briefly the facts of the case and the reasons why the applicant believes the Planning Commission's determinations should be reversed or amended. Said appeal must be filed with the Clerk of the Board of Supervisors within five (5) days of the Planning Commission's action. The Board of Supervisors shall hold a hearing thereon within thirty (30) days after the appeal is filed, at which time the applicant and all persons interested may appear and be heard either for or against the granting of the Permit or amendment of the conditions relative thereto. The Board of Supervisors shall make its decision upon the application within ten (10) days after conclusion of the hearing.

SECTION VII - ENFORCEMENT

- A. It shall be the duty of the Planning Department Staff to enforce the provisions of this ordinance pertaining to the placement and location of buildings and/or structures upon property.
- B. It shall be the responsibility of the Building Division of the Department of Public Works to enforce the provisions of this Ordinance pertaining to the construction of buildings and/or structures upon property.
- C. The Health Department is hereby authorized to adopt and enforce such other rules and regulations as it deems necessary to carry out the provisions of this ordinance.

SECTION VIII - AMENDMENTS AND CHANGES

Whenever the public necessity, convenience, general welfare, or good practice justify such action, the Planning Commission upon its own motion may, upon the verified application of any interested persons or group, initiate proceedings to change the regulations established by this Ordinance.

SECTION IX - PENALTIES

Each violation of this ordinance or of any regulation, order, or ruling promulgated hereunder shall be deemed a misdemeanor and punishable by a fine of not more than five hundred (\$500) dollars or imprisonment for not more than one hundred eighty (180) days, or both such fine and imprisonment, and each day a violation continues, it shall be considered a separate offense.

SECTION X - CONFLICTING REGULATIONS

Where this ordinance imposes a greater or more stringent restriction upon the use of land than is imposed or required by any other Ordinance or regulation, the provisions of this Ordinance shall govern.

SECTION XI - VALIDITY

If any section, subsection, clause, word, or phrase of this Ordinance is held to be unconstitutional or otherwise invalid for any reason, such decision shall not affect the validity of the remainder of this Ordinance. The Board of Supervisors hereby declares that it would have passed this Ordinance and each section, subsection, sentence, clause, word, or phrase thereof, irrespective of the fact that one or more section, subsection, sentence, clause, or phrase be declared invalid or unconstitutional.

SECTION XII - ENACTMENT

This Ordinance shall become effective and be in full force on and after thirty (30) days of its passage and adoption, and prior to the expiration of fifteen (15) days from the passage and adoption thereof shall be published in a newspaper of general circulation printed and published in the County of Merced, State of California, together with the names of the members of the Board of Supervisors voting for and against the same.

The foregoing Ordinance was passed and adopted by the Board of Supervisors of the County of Merced, State of California, at a regular

meeting held on the 5th day of August, 1969,
by the following vote to wit:

AYES: Supervisors Harry P. Schmidt, Johnnie J. Ramondini,
E. G. Nordman, Neill Gallaway.

NOES: None

ABSENT: Supervisor Emory O'Banion.

Harry P. Schmidt
Chairman of the Board of Supervisors
of the County of Merced, State of
California

(SEAL)

ATTEST:

E. T. JOHNSON
County Clerk and Ex-Officio Clerk
of the Board of Supervisors of the
County of Merced, State of California

By B. Skinner

Wildland Fires



III. Fires

A. California's Wildland Fire Problem

California experiences large, destructive wildland fires almost every year, a situation that is unique in the world. The State's continuous expanses of highly flammable brush and other vegetation, rugged terrain, long arid summers, dry north and east winds during the critical part of the year, and a population that insists on seeking living space and recreation in nature's beautiful but flammable and hazardous wildland.

During a 13-day period in 1970, wildfires throughout California destroyed the protective vegetative cover on nearly 580,000 acres of wildland, consumed 722 homes, and damaged thousands of other structures. Sixteen lives were lost.

While wildfires were exceedingly destructive in 1970, large fires occur almost every year in California. The state has a wildland fire problem that continues to take an intolerably heavy toll of life and property, despite advances in technology and fire-fighting effectiveness. Much of the destruction of wildfire occurs within a few critical days each year when air temperature soars, relative humidity drops to near zero, and wind velocity increases to 50 miles per hour and more. Forest, brush, and grass fires burn according to a complex set of physical and chemical laws. The principal ingredients are fuel (the living and dead vegetation that covers the wildlands), topography, and weather.

1. Topography

California's rugged topography has considerable effect on wildland fire behavior, and on the ability of firefighters and their equipment to take suppression action on those fires.

The northern two-thirds of the state has much steep and mountainous terrain. The Great Central Valley forms the

only major area of flat land in the state. To the east of the valley lie the Cascade and Sierra Nevada Ranges, rising to more than 14,000 feet; to the west are the lower mountains of the Coast Ranges which continue into southern California. The mountains are slashed by deep canyons with near vertical sides, often rising 2,000 feet or more to the ridges.

Such rough topography also channels air flow, creating extremely erratic winds on lee slopes and in canyons. Fire starting in the bottom of a canyon may rush quickly to the ridge and become large - before initial attack forces can arrive - simply because of the topography.

2. Fuels

Only 14 percent of California's land area is occupied by cities or by agricultural crops. Another 25 percent is in desert or in barren mountain areas high above timberline. The remaining wildland, some 61 percent, is mountains and hills covered by timber, woodland, brush or grass. All this wildland vegetation reaches some degree of flammability during the dry summer months and, under the right weather conditions, during the winter months. The drier the fuel, the more readily fires ignite and spread. The greater the accumulation of dead fuels in proportion to living fuels, the greater will be the fire's intensity.

Adding to the complexity of the wildland fire problem are the many subdivisions, individual homes, and recreational developments located in the hills and mountains. People build homes there because it is more attractive than living in large urban areas. Unfortunately, despite recent efforts by state and local governments to impose fire safety regulations on such homesites, wildland residents rarely prepare for the inferno that can sweep through the volatile brush and timber and destroy their homes in minutes. More often

than not, the firefighter finds himself having to protect lives and homes while the wildfire's perimeter spreads rapidly out of control, involving many additional structures. The problem is a major one.

3. Fire Weather

California's Mediterranean climate (cool, moist winters followed by long, dry summers) is the delight of tourists, but the bane of wildland firefighters. Total winter precipitation (snow and rain) is greatest in the northern part of the state, and in the high mountains where timber grows. Rainfall decreases sharply with a drop in elevation from the mountains to the lower foothills and valleys; it also decreases latitudinally from northern to southern California. The lesser rainfall supports a growth of brush in the foothill areas of northern California and throughout most of southern California. The long summer period of little or no precipitation is accompanied by relatively high temperatures and low humidity (dry air) away from the immediate coastline. The long rainless periods, heat, and dry air draw moisture out of the large accumulations of dead fuel, and place living vegetation under increased moisture stress.

The most important weather element is the wind. It supplies fresh oxygen to a wildland fire; bends flames forward into new fuels so that fire spreads more quickly, and carries burning brands perhaps miles ahead of the main front so that the fire advances in a leap-frog fashion. The prevailing wind in California generally blows from west to east, bringing marine air from the Pacific Ocean to the interior valleys and coastal mountains. This general wind pattern is modified locally by topography. Occasionally, and especially between September and May, a high pressure ridge of air may move inland over the Great Basin area, while a low pressure trough lies along the length of California. Dry air moves from the

high inland plateau at great speeds, often exceeding 100 miles per hour through the mountain passes. As the air descends to the coast, it also warms and becomes drier, desiccating the wildland fuels. Air temperature rises sharply along the coast. In southern California these easterly winds are given a special name: "The Santa Anas", or "Devil Winds". Occurrence of the dry north or east winds in combination with a winter drought can mean a 12-month wildland fire season in parts of the state. This occurs rather commonly in southern California, where firefighters sometimes spend Christmas on the fire-line.

In their potential effect on the start and spread of wildland fires, these weather elements are commonly unfavorable in California. Destructive forest, brush, and grass fires occur almost every year. Although such fires can and do happen in every month of the year, the most crucial part of the fire season is generally from May through November. During a relatively few days of that period, fuel and weather conditions are often so critical that small fires frequently escape initial attack and become large, destructive conflagrations. With increasing frequency these conflagrations threaten and destroy not only natural resource values, but also life and property.

4. Forest and Grass Fires

Any small fire in a wooded area or dry grassland, if not quickly detected and suppressed, can get out of control. An uncontrolled fire is one of the most destructive forces caused by nature or man. It is a multiple killer of people, livestock, fish and wildlife. It destroys personal and real property, valuable timber, forage, watersheds, and inestimable scenic and recreational value. Severe soil erosion, silting of stream beds and reservoirs, and flooding often are serious aftermaths of fires. Wildland fires take an esti-

mated 1,000 lives each year in the United States, (Dept. of Defense), and cause more than \$ 200 million damage to about 10,000 square miles of land.

5. Causes

Some of these fires are caused by lightning, and scientists are working on ways to prevent this. The rest are caused by man, either deliberately setting fires, or by accident or carelessness; debris burning, smoking, campfires, and use of equipment and machinery as in logging operations. Incendiarists - people who deliberately and maliciously set wildland fires - come in many types. There is the person who sets a fire because he bears a grudge, either against some individual, or against one or more of the public fire protection agencies. Another type of person views a raging fire as a chance to be hired as a firefighter and earn extra money. Other people act on their contention that the wildlands need to be burned off periodically; to open the woods for easier hunting; to produce more forage for domestic or wild animals; or to rid the woods of snakes, insects, disease, or varmints. Then there is the pyromaniac who sets fire to satisfy a sexual or psychopathic urge.

6. Rehabilitation of Burned Wildlands

Unfortunately, the direct losses of lives, improvements, wildlife, timber, protective watershed vegetation and other wildland values are only the beginning in the toll of damage taken by the fires. Indirect future losses also have to be added: soil, water, recreation, aesthetics, and many other tangible and intangible benefits ordinarily derived from the wildland areas. Perhaps the worst potential damage would be what had happened after so many other large fires in past years: winter rain could rush unimpeded down the denuded slopes to cause destructive flooding in the populated

areas below. With the flooding water could come tons of loosened soil and rocks to demolish property, and to clog reservoirs in the downstream canyons and floodplains. In January 1969, following the 20,000 acre Canyon Fire of August 1968, a wave of mud and debris washed downslope into the town of Glendora, destroying homes and other property valued at some \$ 8 million. It was necessary, therefore, to take immediate measures to cover and protect the blackened watershed areas with fast-germinating grass seed before the first winter rains fell.

Hopefully, the first rains that fell would be gentle and sustained, permitting the grass to germinate and quickly send roots down into the soil to hold it in place when later heavier rains fell. Such revegetation projects had not always been successful in past years because of the vagaries of rainfall intensity and distribution. Still, the effort had to be made in consideration of potential values that could be saved.

At the same time that the grass seeding project is being carried out, the removal and replacement of timber burned by the fires is being planned by the U.S. Forest Service and other agencies. Quick removal of killed or heavily damaged coniferous trees is necessary to prevent the rapid buildup of forest insect populations to epidemic proportions. If the insects became established in the fire-weakened trees and grew in number, they would move out of the burned areas into adjacent living trees, resulting in devastating damage to the forest. Such insect damage had occurred many times after past fires, therefore the Forest Service quickly arranges for the sale and harvest of the burned trees on National Forest lands by local lumber companies. After the trees are removed, the Forest Service cleans up the area and plants millions of young seedlings to start the slow process of regrowing a new forest.

3. Grassfires in the County of Merced

On May 20, 1974, the Merced Sun Star published a short, but very important article under the title "Grass Fire Hazards", which we would like to repeat here:

"With warmer temperatures and "summer-like" weather soon arriving, it is imperative that Merced County residents observe caution to avoid damaging fire possibilities.

Merced County firemen have already experienced a rash of grass fires this year, mainly caused by carelessness in burning or failure to control large dry growth.

It is obvious that each fire starts small and has the very real potential of extensively damaging property and injuring or killing county residents.

There are several ways the danger of fire can be minimized. Fire breaks can be constructed between pastures and roadways and large stands of grass and brush can be disked.

Residents should pay particularly attention to removing dry grass and trash from near storage buildings or dwellings. Control burning or agriculture wastes should be conducted with adequate supervision and advanced planning. Persons may be cited for burning on designated "no burn" days or for failure to obtain burning permits.

With caution and foresight, some of the heavy losses experienced each summer in rural areas can be alleviated."

The following two pages contain some statistics compiled by the Merced County Fire Department.

FIRE STATION STATISTICS

1 9 7 3

<u>STATION</u>	<u>VALUE SAVED</u>	<u>VALUE LOST</u>	<u>TOTAL VALUE</u>	<u>RESPONSES</u>
ATWATER	\$ 71,820.00	\$ 21,935.00	\$ 93,755.00	336
BALLICO	54,500.00	5,050.00	59,550.00	67
BARFIELD	39,677.00	11,714.00	51,391.00	42
CRESSEY	36,530.00	2,125.00	38,655.00	81
DELHI	80,755.00	26,675.00	107,450.00	270
DOS PALOS	138,120.00	37,990.00	176,110.00	157
DOS PALOS WYE	107,595.00	61,660.00	169,255.00	112
EL NIDO	84,475.00	24,757.00	109,232.00	82
GUSTINE	26,650.00	23,338.00	50,038.00	77
HILMAR	309,015.00	29,335.00	338,350.00	127
LE GRAND	189,302.00	93,730.00	283,032.00	138
LIVINGSTON	74,925.00	72,915.00	147,840.00	176
LOS BANOS	211,347.00	34,452.00	245,799.00	430
MCKEE	167,713.00	24,452.00	192,158.00	127
MERCED	2,435,045.00	115,070.00	2,550,115.00	534
PLANADA	142,460.00	230,647.00	373,107.00	176
SANTA NELLA	136,900.00	15,880.00	152,480.00	93
SNELLING	54,450.00	9,990.00	64,440.00	118
SOUTH DOS PALOS	29,670.00	1,650.00	31,320.00	22
STEVINSON	7,900.00	17,600.00	25,500.00	91
WINTON	396,355.00	61,015.00	457,370.00	228

<u>TYPE</u>	<u>SAVED</u>	<u>LOST</u>
AIRCRAFT	\$ 8,000.00	\$ 8,000.00
FARM EQUIPMENT	62,955.00	11,970.00
GRASS	456,143.00	52,882.00
RANGELAND	397,762.00	26,137.00
STRUCTURES	3,320,130.00	563,960.00
VEHICLES	347,305.00	178,010.00
HAY	53,235.00	78,707.00

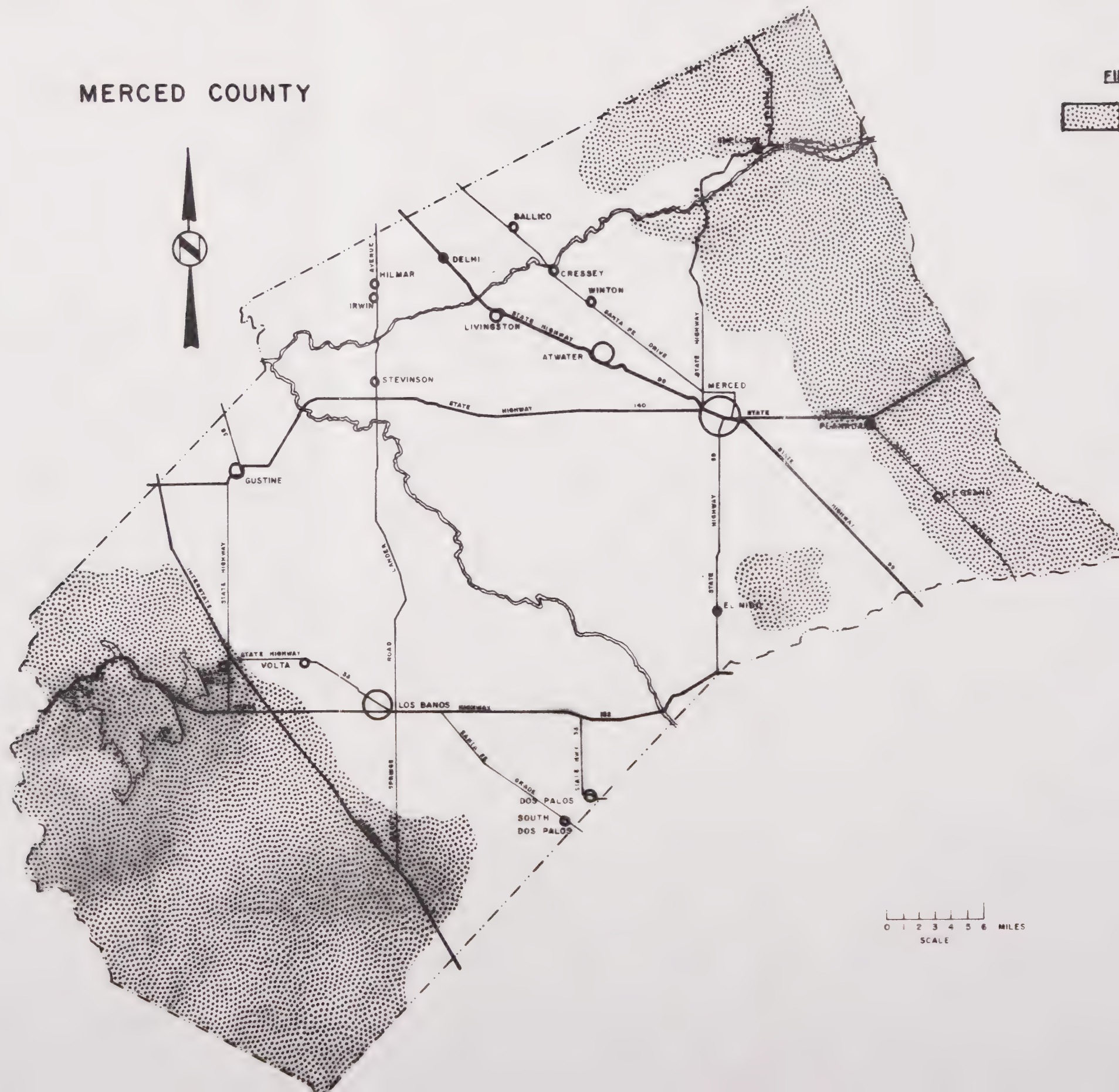
P R E V I O U S F I R E S T A T I S T I C S

	1968	1969	1970	1971	1972	1973
EMERGENCY RESPONSES	3429	3792	3478	3299	2625	3484
ACCIDENT & RESCUE	202	178	137	157	145	157
CONTROL BURNS--OUT OF CONTROL	70	79	39	53	70	84
ILLEGAL BURNS	0	0	0	0	61	66
DROWNINGS	7	12	9	10	11	8
ELECTRICAL	45	23	28	37	31	38
FALSE ALARMS	123	185	181	162	104	125
FLAMMABLE LIQUIDS	20	12	9	12	11	20
GRAIN	21	4	0	0	5	9
GRASS	353	493	418	350	203	326
HAY	39	23	30	29	19	32
POWER POLES	37	43	49	0	8	44
RAILROAD RIGHT OF WAYS	62	94	109	50	29	38
RESUSCITATOR CALLS	134	161	162	189	188	235
ROADSIDE GRASS	134	196	176	150	105	157
RANGELAND	12	13	23	27	16	26
STRUCTURES	213	215	190	195	184	148
STUBBLE	11	10	2	9	5	17
TRASH ETC	161	102	131	166	111	134
VEHICLES	179	170	195	185	171	182
HELPER INCORPORATED CITIES	359	395	340	335	327	401
HELPER SAME STATION	473	528	455	419	297	335
HELPER OTHER STATIONS	724	760	705	705	406	542
HELPER OUT OF THE COUNTY	47	91	84	51	49	87
LIVES-LOST-FIRES	4	7	0	1	4	2
AIRCRAFT ACCIDENTS	3	3	2	0	6	5

MERCED COUNTY

FIRE HAZARDOUS AREA

 DRY GRASS & BRUSH



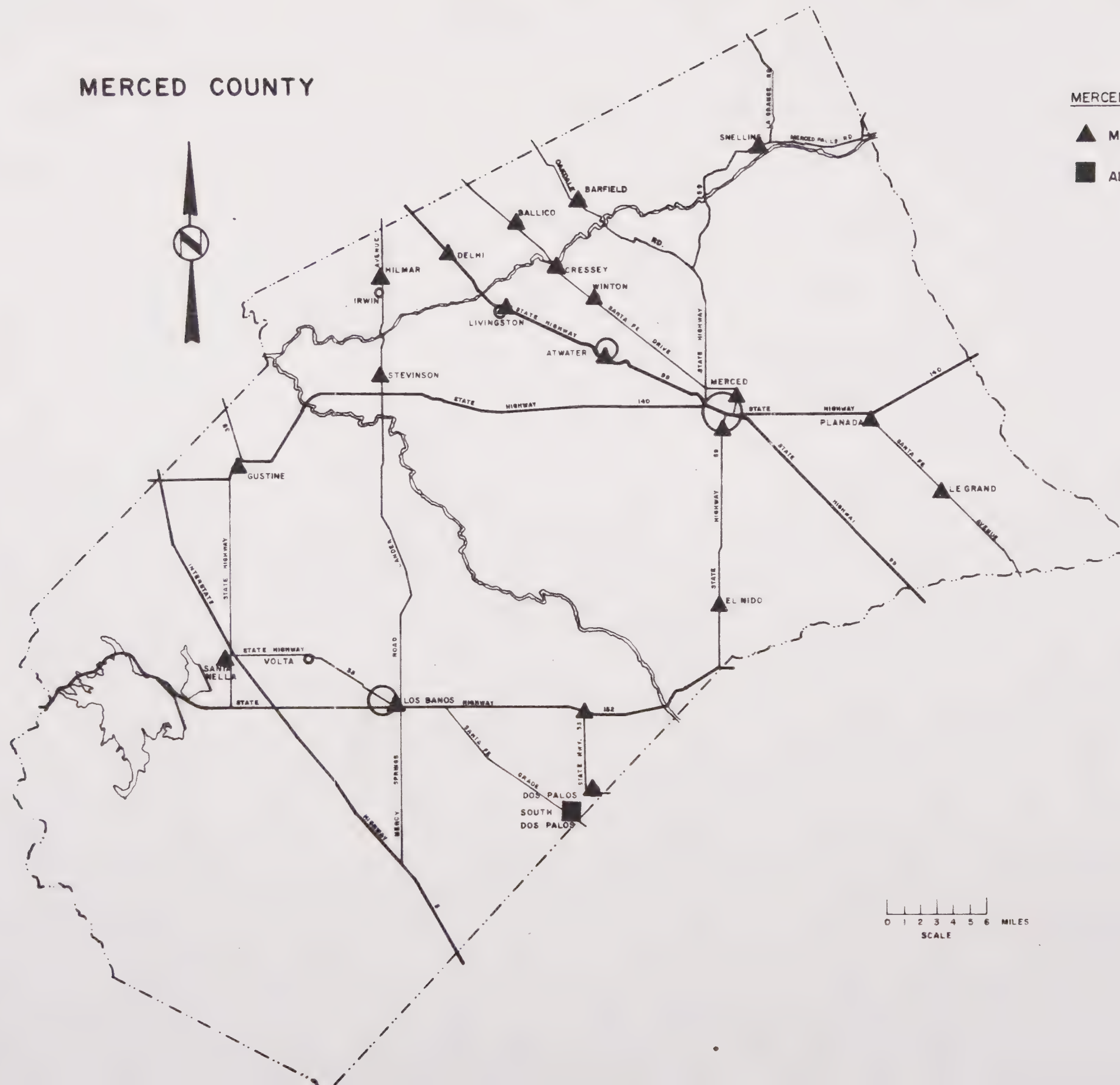
0 1 2 3 4 5 6 MILES
SCALE

MERCED COUNTY

MERCED COUNTY FIRE STATIONS

▲ MANNED 24 HOURS DAILY

■ ALL VOLUNTEERS



Nuclear Fallout



VIII. Nuclear Fallout

A. The Atomic Age

It has often been said that the Atomic Age began in 1945, when the first three atomic explosions took place. On July 16, a test bomb was set off near the Alamogordo Air Base in New Mexico. A United States bomber dropped an atomic bomb on Hiroshima, Japan, on August 6 (Japanese time). The bomb razed or damaged buildings in an area of some four square miles, and claimed well over a hundred thousand casualties. Unheard-of amounts of radiation were released and took a heavy toll of the inhabitants in the days that followed. Another Japanese city, Nagasaki, fell victim to an atomic bomb three days later.

1. Radioactivity

The words "atomic energy", and "radioactivity" assumed new significance in the affairs of men. Yet these words were not new to many scientists, technicians and medical men. They had known about X-rays, radioactive atoms and radioactivity for almost half a century. Years before the first atomic explosion took place, various scientists realized that enormous amounts of energy could be released by splitting the nucleus of the atom.

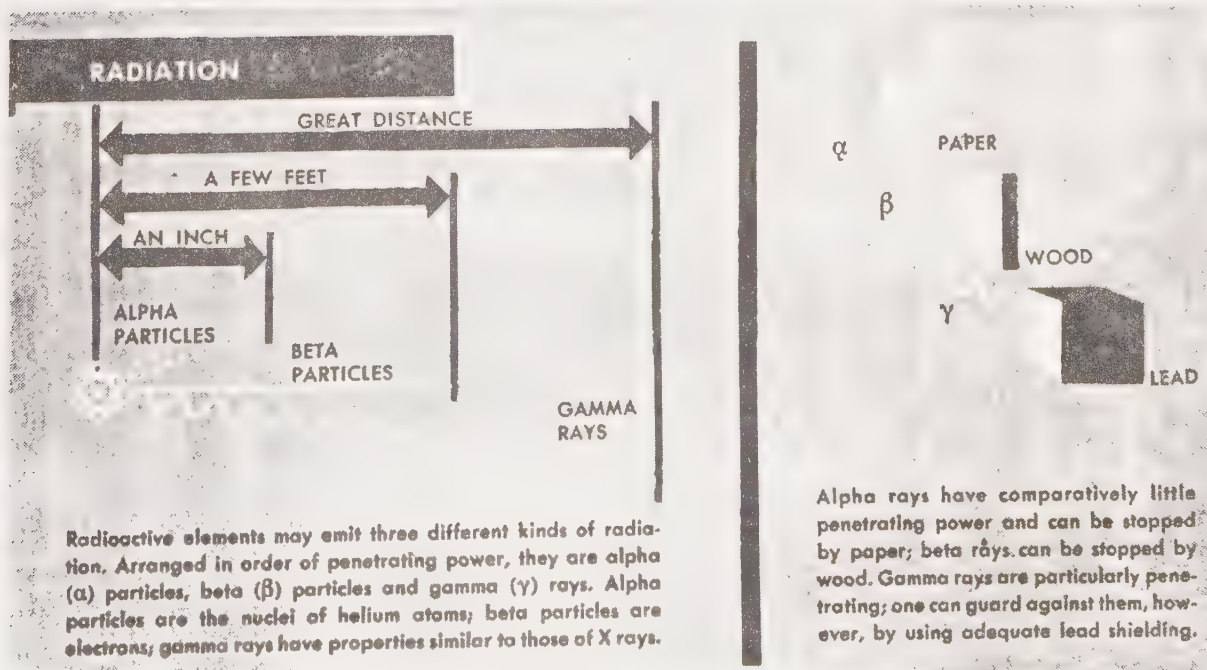
2. Alpha, Beta and Gamma Rays

Scientists learned that radioactive elements may emit three different kinds of radiations. Arranged in order of increasing penetrating power, these are known as alpha, beta and gamma rays. Despite their names, the first two rays are really distinct particles, bearing an electrical charge. The alpha particles are atoms of helium, from which the orbital electrons have been stripped. The beta particles are electrons, which have been thrown off with such violence from radioactive nuclei that they have become high-speed bullets. Gamma rays form the most penetrating radiation given off by elements such as radium; they have properties identical to those of X-rays.

3. X-Rays

In 1895, Professor Wilhelm Konrad Roentgen discovered X-rays in his university laboratory at Wuerzburg, Germany. He applied the name "X" to them, because they were unknown until then.

Researchers soon found that the radiations from X-ray tubes and from radioactive substances were highly injurious to living tissue. Pierre Curie, co-discoverer of radium, was one of the early victims; he suffered a skin burn on his arm when he exposed it to radium rays. His wife, Marie, who shared with him the honor of having discovered radium, lived a long life. Eventually, however, she died from the harmful effects of constant overexposure to radium. Many of the pioneers in X-ray research succumbed to the damaging effects of the rays. A number of them died of cancer, caused by the deadly radiation, many years after they had first been exposed to it.



Source: The Book of Popular Science, Grolier Inc., N.Y.

Only a comparatively small number of scientists and technicians were particularly concerned about radiation hazards until the atomic bomb fell on Hiroshima in August 1945. Newspaper accounts spoke of the atomic blast and the searing heat of the fireball that appeared at the instant of the explosion. But what particularly impressed readers, perhaps, was the fact that hundreds of thousands of persons had been exposed to the deadly radiation emitted as the bomb burst. It was freely predicted that Hiroshima would remain uninhabitable for years to come.

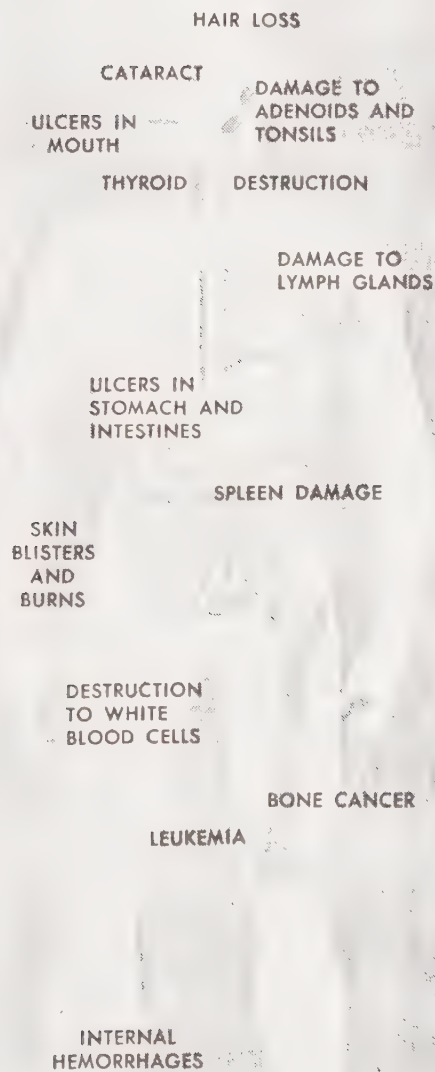
4. Long-Term Effects

This proved to be an exaggeration, for people continued to live in the city. As the weeks passed, however, thousands of the inhabitants sickened, and many of them died. They were victims of radiation disease, or "atomic bomb disease", as it was also called. This disease continued to take its toll in the following years. A decade after the dropping of the bomb, people showed delayed symptoms of radiation damage. Penetrating radiation had become a problem that vitally concerned not merely a few specialists, but all mankind.

A war with nuclear weapons would bring about severe contamination of very large land areas with local fallout. In many regions the land would be unfit for human occupation for months. Besides, the contamination of the soil with long-lived radioactive elements would affect crops and livestock.

One could provide protection against such penetrating radiation by thick-walled structures or by underground shelters. Unfortunately, when an atomic bomb detonates, one must also reckon with the blast effects, to say nothing of the heat effects. It would be prohibitively expensive to construct an adequate number of shelters that could withstand the heavy blast pressures within three miles of a multimegaton burst.

RADIATION DAMAGE FROM ACUTE EXPOSURE



Source: The Book of Popular Science, Grolier Inc., N.Y.

B. A Nuclear Explosion in the United States*

If you are close to where a nuclear weapon explodes, you could not survive the primary effects of blast or heat. If, however, you have adequate protection, you can survive the secondary and more widespread effect of the weapon: radioactive fallout.

1. What is Fallout?

Dangerous radioactive particles. When a nuclear weapon explodes on or near the ground, tons of earth are drawn up into the fireball produced by the explosion. This earth mixes with radioactive materials in the fireball, and eventually falls back on the ground in the form of dust or fine sandlike particles called "fallout".

These "fallout" particles are highly radioactive. The primary danger is from the invisible "gamma rays" they give off. These rays damage living cells of humans and animals, and can cause sickness and death. Radiation sickness is not contagious, and the rays cannot make things radioactive.

Fallout particles can be seen, felt, filtered, swept, brushed or washed off in the same manner as fine dust or sand.

2. Fallout Protection

There is no way of predicting in advance when or how soon fallout will settle to the ground. This depends on the speed and direction of winds. Close to the explosion, fallout may arrive within 20 or 30 minutes, but may not arrive for several hours farther downwind. Fallout may fall several hundred miles away from the explosion. Because of these various factors, after a nuclear attack, dangerous levels of fallout could occur anyplace in the United States. Everyone, therefore, must have protection in case fallout occurs in his community. - Fallout radiation loses its strength

* Information furnished by the Dept. of Defense

when it passes through material,
as the distance from the fallout particles
is increased,
with passage of time.

There are three protective measures:

- a. Distance. Since fallout arrives sooner and is more intense close to the bomb burst, your distance from the explosion is an important safety factor. If local authorities determine that evacuation of your area is practical, you will be so instructed.
- b. Shielding. Fallout radiation can pass through any material, but some of it is "absorbed" on the way through. Thus, if sufficient shielding is put between you and the fallout, the radiation which comes through will not harm you.
- c. Decontamination. Radioactivity decays as time passes. Moreover, fallout, like dust, can be removed from most surfaces by washing, by vacuum cleaning, by plowing under. The danger in decontamination lies in exposure. Therefore, except for personal decontamination (such as removal of contaminated outer garments), decontamination should be carried out only under official instructions. Special monitoring stations will estimate the path of fallout. Radiological monitoring will determine the intensity of radiation in local communities.

3. Emergency Broadcast System (EBS)

Certain radio stations in your area have been designated as part of the nationwide Emergency Broadcast System (EBS). These stations, because they have fallout protection, can continue to broadcast if fallout should occur in your community.

If a nuclear attack occurs, EBS stations will remain on the air to broadcast official information and instructions to the public. All other TV and radio stations will stop broadcasting. EBS stations serving Merced County are: KMJ - 580 KHz, KFRE - 940 KHz, KYNO - 1300 KHz, KYOS - 1480, KWIP - 1580 KHz, and 620 KHz.

C. Preparation for Survival

The need for shelter against the effects of nuclear war is one of utmost importance to every Californian. Missiles and other hardware of military forces are only partly measures as a deterrent to war, or as effective tools of foreign policy negotiations - unless our civilian population is adequately protected and can survive to rebuild.

Shielding or shelter is considered to be the best means of obtaining civilian protection - protection against blast - and the bigger problem of FALLOUT. Additional protection against biological and chemical warfare and against firestorm can be incorporated by providing filters or sealing devices in shelter ventilating systems.

1. Survival Supplies

You might have to stay in a fallout shelter for only one or two days, or for as long as two weeks. The supplies you should have are shown below. Purchase enough now to last for fourteen days and store it together in one place. Supplies which will spoil should be used periodically and replaced.

a. Supplies to take to a Public Shelter

- Prescription medicines (diabetics, heart patients, etc.);
- special food for invalids and infants;
- a package of extra food (canned meats, dry foods, sugar, salt, canned fruit and milk);
- blankets, sleeping bags, and air mattresses;
- extra change of clothing in a plastic bag;
- first aid kit;
- soap, toothpaste, toothbrush, and towels;
- portable radio with batteries, books, games, and compact toys if there are children;
- flashlight and extra batteries;
- paper towels.

b. Do NOT take to the Public Shelter

- pets;
- firearms;
- narcotics;
- alcohol;
- cigarettes;
- explosives.

2. Fallout Protection Shelters

a. Public Shelter

This sign indicates that the building or facility to which it is attached is a Public Fallout Shelter.



From the time the attack warning signal is sounded, you will have a total of 90 minutes to go to your shelter, public or private. It is NOT required that you use a public shelter. Families may find the idea of providing shelter in their own homes more attractive. All schools have their own fallout shelters, and your children will be well taken care of by school authorities.

b. Family Shelter

There are many different ways of constructing your own shelter, inside, under, or near your residence. You can get plans from your Emergency and Disaster Control office, (722-3222 for the County of Merced), or you may want to use the design on the following pages.

c. Improvised Shelter

If an enemy attack occurs when you are at home, and you have not made any advance shelter preparations, you can make an improvised shelter either inside or outside of your house. Just remember: get as much heavy material and distance between you and the fallout as you can, as fast as you can. Heavy material will shield you from fallout radiation.

Shielding material such as bricks, dirt, sand, concrete blocks and concrete are best to use. You can use newspapers, magazines or books as shielding material; however, they will require more thickness, and take up more space to give the same amount of shielding as heavier materials.

Baled hay and sacked grain can also be used as shielding material. Due to the bulk of this kind of material it will also have the effect of increasing distance between you and the fallout. Radiation rays from fallout are similar to light, in that they travel in a straight direction. They do not bend around corners. The opening to any shelter must be arranged with some type of shielding baffle to prevent direct entrance of radiation.

Be sure that any place you select to improvise a fallout shelter has adequate ventilation.

3. Be Prepared

Here are some things you can do right now that will better prepare you and your family to survive and recover if a nuclear attack should occur:

KNOW	the attack warning signal,
READ	and discuss this plan with members of your family. Be sure they understand it.
HAVE	members of your family take a course in "Medical Self Help",
KEEP	family immunization records up to date,
TEACH	members of your family how to turn off utilities,
KEEP	your automobile fueled,
ARRANGE	a safe place to store your valuable documents,
MAKE	a "Family Emergency Plan."

ABOVE GROUND HOME FALLOUT SHELTER

H-12-2
September 1969



Protection is provided in an
outside above ground shelter.
The shelter can be used as
a tool shed or workshop.



DEPARTMENT OF DEFENSE • OFFICE OF CIVIL DEFENSE

H-10

GENERAL INFORMATION

This family fallout shelter is intended primarily for persons who prefer an aboveground structure as a shelter. The shelter is designed for placement in a backyard or to the side of the house. The protection factor is at least 40, which is the standard of protection established by the Office of Civil Defense for public shelters. The shelter will adequately protect against radioactive fallout from nuclear explosions.

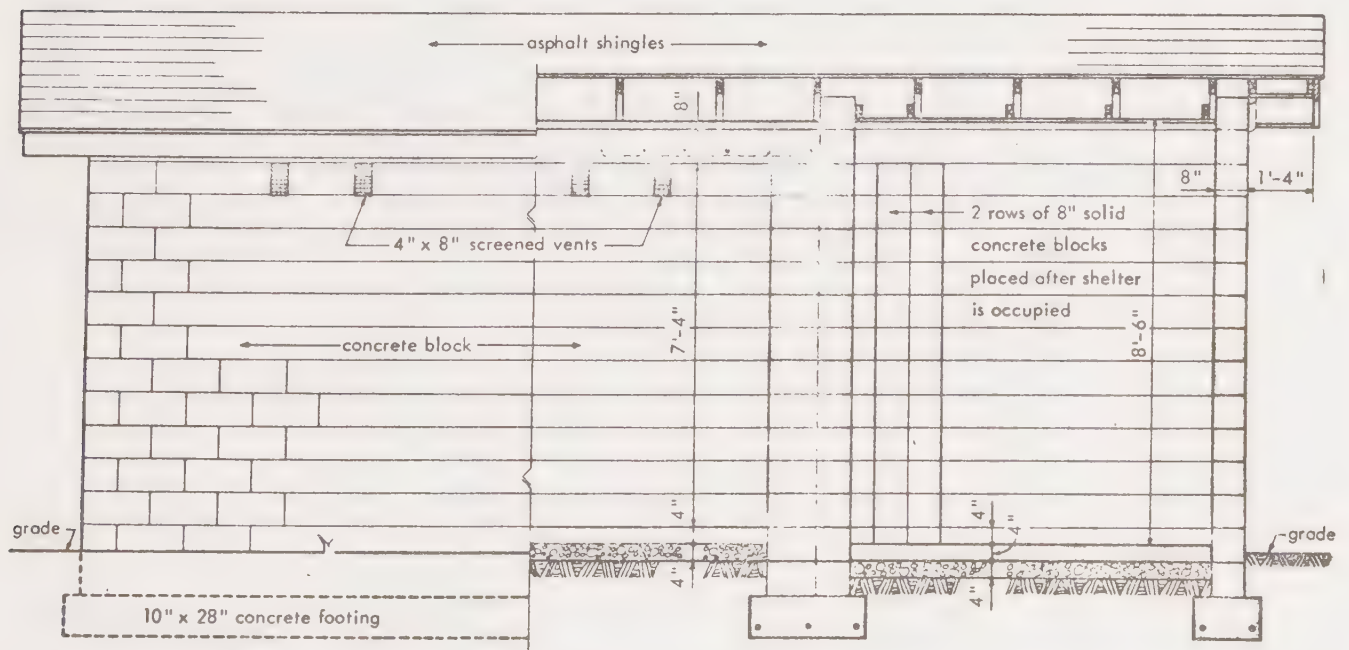
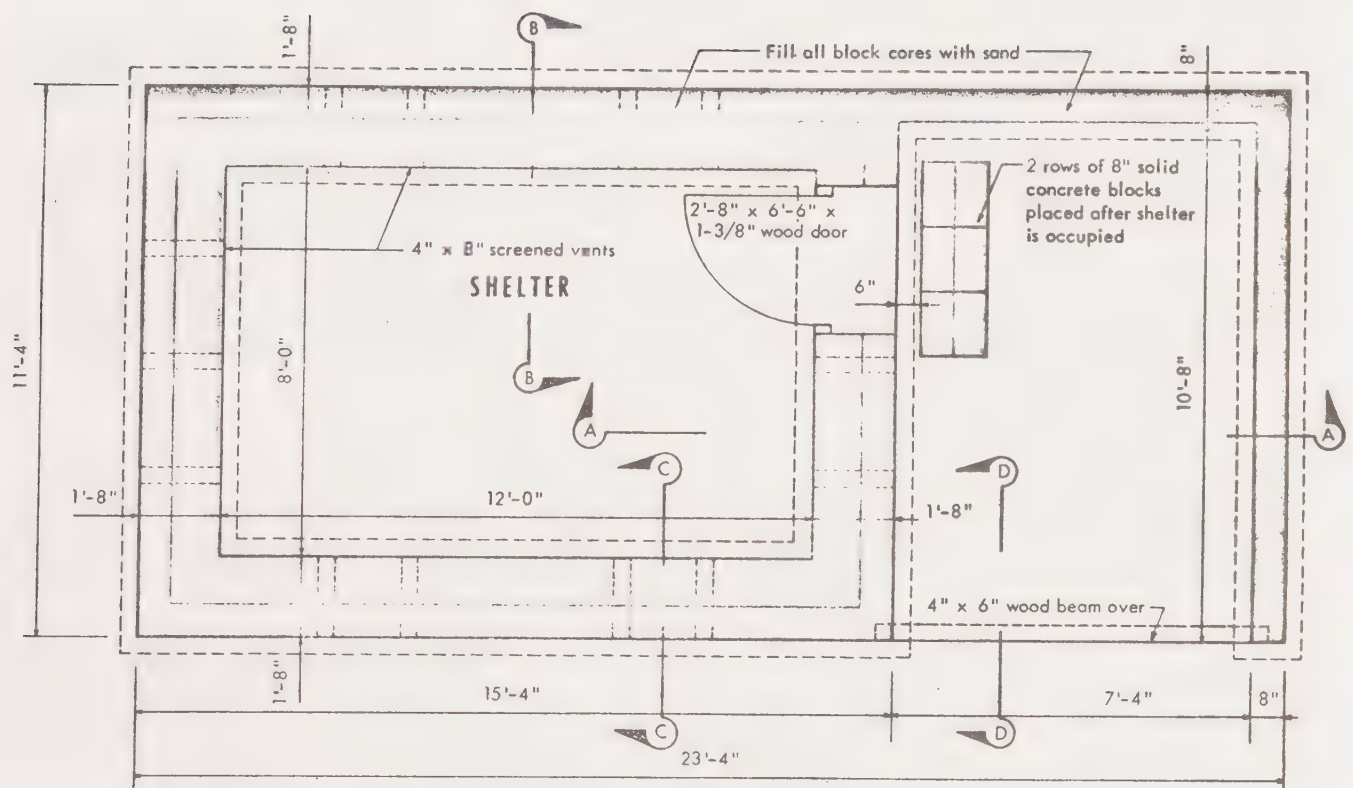
The detailed drawings show a shelter that will house six adults. It can be built of two rows of concrete blocks, one 12" and one 8", filled with sand or grout, or of poured reinforced concrete. Windows have been omitted, and it is suggested that electric lights be installed from the house circuit.

The details and construction methods are considered typical. If materials other than shown, are selected -- for example, concrete block faced with brick -- care should be taken to provide the same weight of materials per square foot of wall space or roof area. This structure has 200 lb. per sq. ft. in the walls and 100 lb. per sq. ft. in the roof.

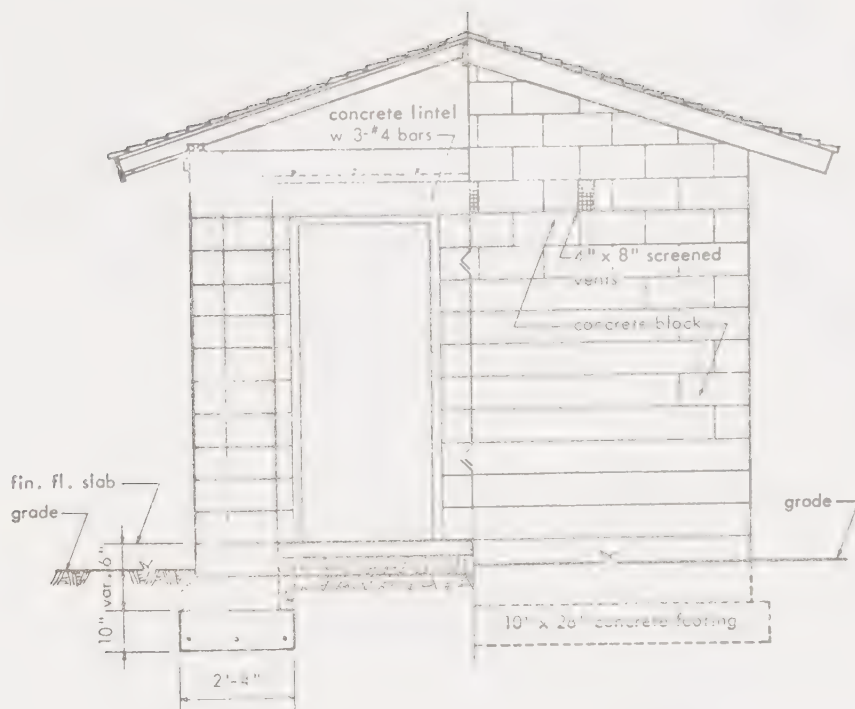
This structure has been designed for areas where frost does not penetrate the ground more than 20 in. If it is desired to build this type of structure where 20 in. is not a sufficient depth for footings, one or two additional courses of concrete blocks may be used to lower the footings. Average soil bearing pressure is 1,500 lb. per sq. ft. Most soils can be assumed to support this pressure without special testing or investigation.

The baffle wall outside the entrance to the shelter is extended out 7'-4" to allow storage of lawn equipment such as wheelbarrows, lawn mowers, etc. If additional space is desired, extend this dimension.

Before starting to build the shelter, make certain that the plan conforms to the local building code. Obtain a building permit if required. If the shelter is to be built by a contractor, engage a reliable firm that offers protection from any liability or other claims arising from its construction.



SECTION A-A



SECTION B-B ELEVATION

NOTES

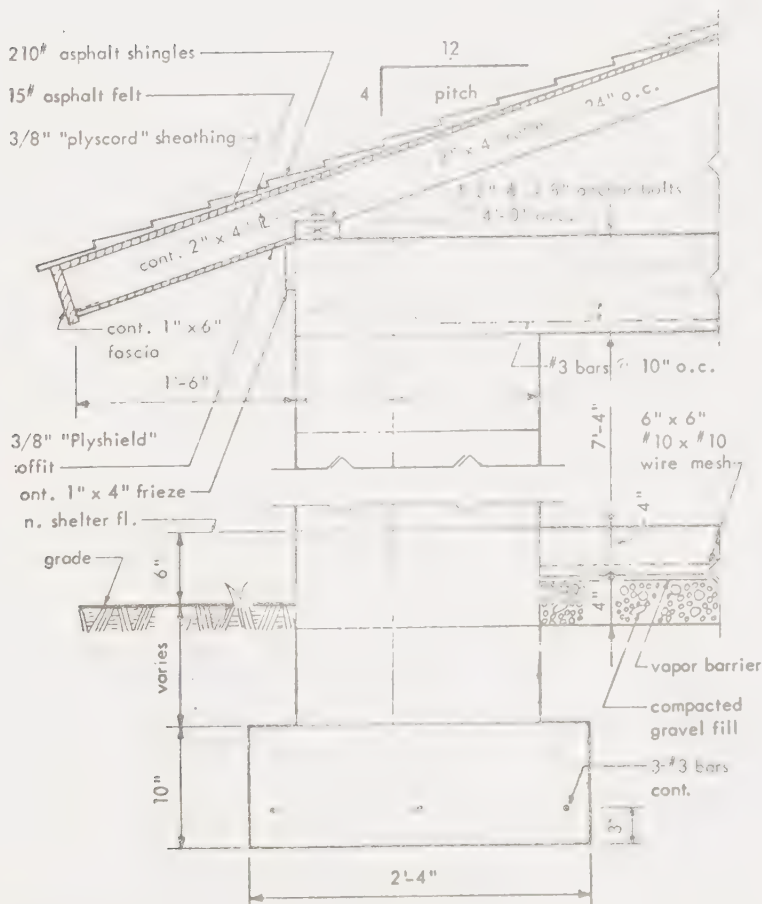
Provide horizontal joint reinforcement for 1'-8" walls in every third course and metal cross ties at 2'-0" o.c. in every alternate course.

If concrete is used in place of block, the walls of the shelter shall be 1'-2" thick with #4 bars at 14" o.c., each way, each side.

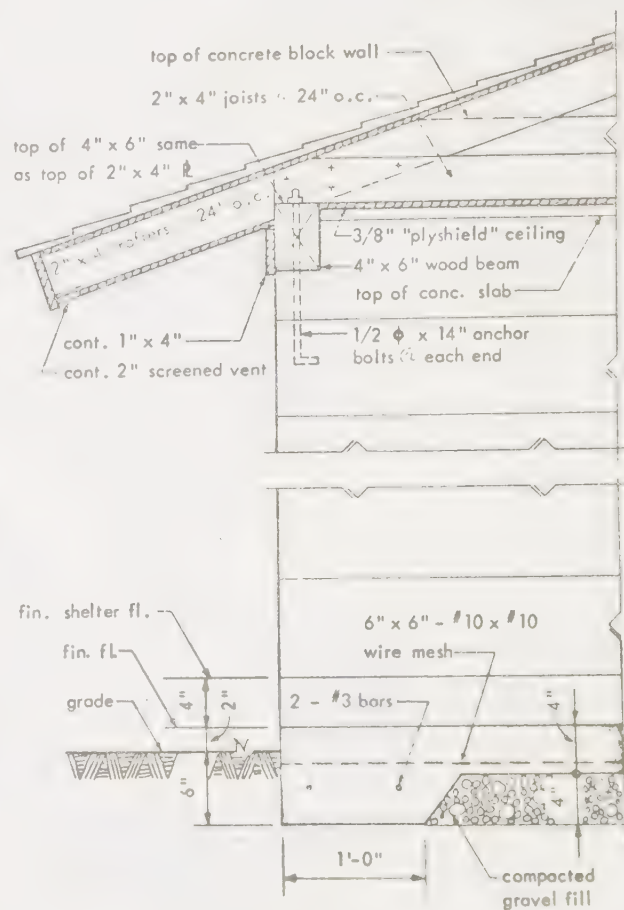
The dimension from finish grade to bottom of footings is dependent upon the depth of frost and varies with geographic location. Consult your local building code.

In areas subject to earthquakes, walls shall be reinforced with #4 bars at 16" o.c. vertically. Place bars in block cells and then fill with grout. Lap bars between wall and footing dowels, and between wall and roof slab.

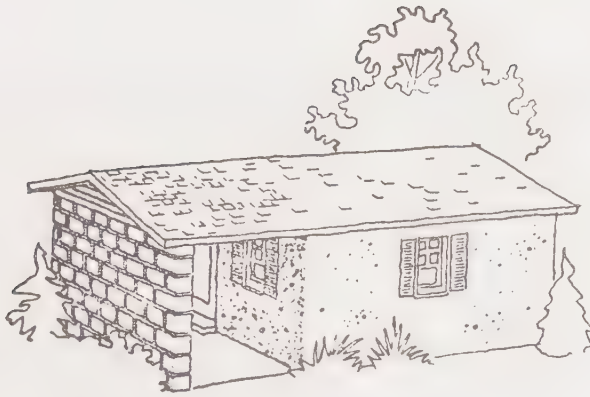
Structural design data:
Steel = 20,000 psi
Concrete = 2,500 psi
Soil (minimum) = 1,500 psf



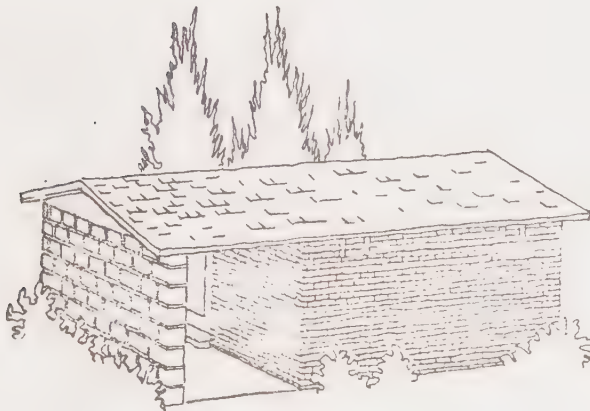
SECTION C-C



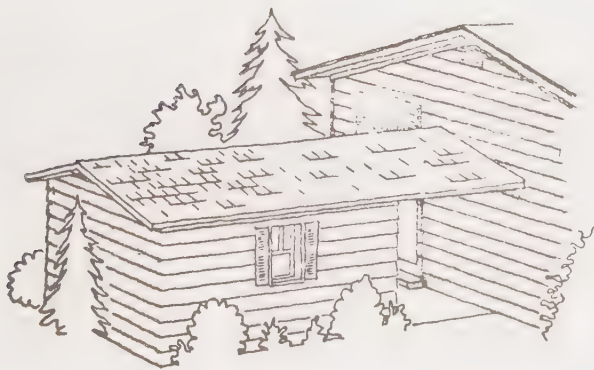
SECTION D-D



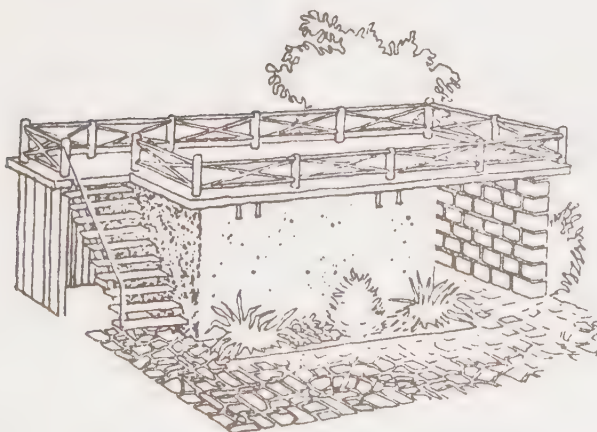
FIRST ALTERNATE indicates windows in the workshop area. Solid blocks, equal to a thickness of 12 inches, should be available to fill these openings in event of emergency. Window sizes should be kept small.



SECOND ALTERNATE shows the cement block faced with bricks. Use one course 4 inch brick and two courses of 8 inch cement block to obtain the required wall thickness.



THIRD ALTERNATE is to attach the tool shed or workshop to the house with a covered area between. In this case, the facing materials should match the house.



FOURTH ALTERNATE is to install built-up roofing of asphalt or tar, on the concrete deck or other wearing surface on top for play area.

GUIDE TO CONTRACTS AND SPECIFICATIONS

It is generally advisable to have a written contract with your contractor as well as specifications to supplement the drawing. A widely-used and convenient contract form for construction of this size is AIA Document A 107, "Short Form Agreement for Small Construction Projects," which is available from The American Institute of Architects, The Octagon, Washington, D.C. 20006. It would be impractical to write a specification to suit every local condition; however, the following summary of generally accepted construction materials and practices is a useful guide :

CONCRETE

For details of concrete construction, follow "Building Code Requirements for Reinforced Concrete (ACI 318 - Latest Edition)." This publication can be obtained from the American Concrete Institute, Detroit, Michigan 48219.

DAMPPROOFING

Dampproofing the bottom slab is necessary to make the room more comfortable in most areas. Any contractor will be accustomed to compacting gravel and applying a polyethylene vapor barrier course. In areas that regularly experience high humidity, the outside walls of the block or concrete should be treated with a colorless type of protective coating material which is readily available at building supply stores. In areas of very low humidity, it may be possible to omit dampproofing course.

VENTILATION

Ventilation is obtained by natural convection. Air will enter the doorway and be exhausted through the holes at the ceiling. If a roof exhaust ventilation system is desired, the following manufacturers make units that will meet the requirements:

The G. C. Breidert Co.*
San Fernando, California 91341

Penn Ventilator Co.*
Philadelphia, Pennsylvania 19133

*The listing of names of specific manufacturers of equipment does not denote a preference for their products.

OPTIONS

To accommodate additional persons, increase the shelter length 2' -6" for each two shelter spaces. Do not increase the 8' -0" width.

Lighting and receptacles may be installed with electric service obtained from a separate residence circuit. A branch circuit breaker should be installed inside the shelter.

MATERIAL LIST

Item	Quantity
Concrete:	
footings	4.5 cu. yd.
floor	2.3 cu. yd.
ceiling	3.4 cu. yd.
Total	10.2 cu. yd.
Steel Reinforcing:	
footings (3# deformed bars)	198 lin. ft.
ceiling (3# deformed bars)	257 lin. ft.
Total	455 lin. ft.
Tie Wire	100 lin. ft.
Masonry:	
8" X 8" X 16" hollow concrete blocks	800
12" X 8" X 16" hollow concrete blocks	430
8" X 8" X 16" solid concrete blocks	75
sand (to fill cores)	12 1/2 yds.
Mortar:	
sand	1 1/2 yds.
portland cement	9 bags
lime	2 bags
Lumber: ("Construction" grade)	
2" X 4" X 8'-0" roof rafters	32 pcs.
1" X 6" ridge	26 lin. ft.
2" X 4" X 12'-0" ceiling joists	5 pcs.
4" X 6" X 8'-0" beam	1 pc.
2" X 4" bearing plate	36 lin. ft.
4'-0" X 8'-0" X 3/8" "plyscord" sheathing	13 sheets
4'-0" X 8'-0" X 3/8" "plyshield" soffit & ceiling	6 sheets
1" X 4" X 3/4"	48 lin. ft.
1" X 6" X 3/4"	84 lin. ft.
3/4" - 1/4φ	24 lin. ft.
2'-8" X 6'-6" X 1 3/8" solid core wood door	1
2'-8" X 6'-6" X 5 1/2" wood jamb	1

Miscellaneous:

15# roofing felt	4 1/2 squares
210# asphalt shingles	4 1/2 squares
1/2" ϕ X 8" anchor bolts	12
1/2" ϕ X 14" anchor bolts	2
copper screen	20 sq. ft.
6" X 6" - #10 X #10 wire mesh	200 sq. ft.
polyethylene vapor barrier (4 mil)	200 sq. ft.
gravel fill	2 1/2 yds.
4" butts w/screws	3
lockset	1
16d common nails	25 lbs.
8d common nails	20 lbs.
6d common nails	10 lbs.
8d casing nails	5 lbs.
exterior paint, primer	5 gals.
exterior paint, 2 coats	6 gals.
interior paint, primer	4 gals.
interior paint, 2 coats	5 gals.

Distribution:

OCD Regions and Staff College
State & Local CD Directors
Foreign Activities

A P P E N D I X

Bibliography

California Region Comprehensive Framework Study, California Region Framework Study Committee, Pacific South-West Inter-Agency Committee Water Resources Council, 1971

Appendix V - Water Resources

Appendix VI - Land Resources and Use

Appendix IX - Flood Control

Appendix X - Irrigation and Drainage

Appendix XI - Municipal and Industrial Water

Appendix XV - Water Quality, Pollution and Health Factors

Soil Survey, Merced Area, California, U.S. Dept. of Agriculture, Soil Conservation Service, 1962

Soil Survey, Los Banos Area, California, U.S. Dept. of Agriculture, Agricultural Research Administration, 1952

Merced County Water Supply and Wastewater Management Study, Engineering Science Inc., Grunwald, Crawford & Assoc., Sept. 1971

Review Report for Flood Control on Merced County Streams, California, Department of the Army, June 1969

Principles of Geology, Gilluly, Waters, Woodford; W.H. Freeman and Co., 1968

Earthquake Country, Robert Iacopi; Lane Books, Menlo Park, 1972

Urban Geology Master Plan for California, Bulletin 198, California Division of Mines and Geology, Sacramento, 1973

Geology and Earthquake Hazards, Association of Engineering Geologists, Grading Codes Advisory Board and Building Code Committee, Southern California Section, July 1973

Environmental Resources Management Element, Stanislaus Area, Stanislaus Area Association of Governments, 1974

Land Subsidence due to Groundwater Withdrawal in the Los Banos-Kettleman City Area, Calif. Open-File Report, United States Dept. of the Interior, Geological Survey, and Calif. Dept. of Water Resources, 1972, Parts 1 - 3.

Bibliography (continued)

- The Book of Popular Science, Grolier Society Inc., 1965
- Revolution of the Earth Sciences, Peter J. Wyllie, Encyclopaedia Britannica, Inc., 1971
- Earthquake and Geologic Hazards Conference, The Resources Agency, State of California, December 1964
- Effects of Earthquake on Hebgen Lake, U.S. Geological Survey Professional Paper 435
- The Restless Earth, Nigel Calder, The Viking Press, New York, N.Y.
- The San Fernando Earthquake of February 9, 1971, and Public Policy, Special Subcommittee of the Joint Committee on Seismic Safety, California Legislature, July 1972
- Los Banos Enterprise, Enterprise Diamond Jubilee Edition, July 1965
- California Geology, California Division of Mines and Geology, various issues
- California Aflame ! September 22 - October 4, 1970, State of California, Dept. of Conservation, Division of Forestry
- Recommendations to Solve California's Wildland Fire Problem, Task Force on California's Wildland Fire Problem to Norman B. Livermore, Jr., Resources Agency Secretary, June 1972
- Seismic Safety Information, California Div. of Mines & Geology, July 1972
- Seismic Activity in the Vicinity of San Luis Reservoir, U.S. Department of the Interior, Bureau of Reclamation, Nov. 1970
- Ground-Water Conditions and Storage Capacity in the San Joaquin Valley, California, Geological Survey Water-Supply Paper 1469, U.S. Dept. of the Interior in cooperation with the Calif. Dept. of Water Resources, 1959
- Interim Water Quality Control Plan, Central Valley Basin, Volume Two, State Water Resources Control Board, 1971
- Report and General Soil Map, Merced County, California, U.S. Dept. of Agriculture, Soil Conservation Service, 1967

Bibliography (continued)

Seismic Safety Element, County of Merced, 1973

Open Space and Conservation, County of Merced, 1973

Environmental Resources Management Element, City of Merced, 1974

California Air Quality Data, California Air Resources Board, Technical Services Division, Sacramento, 1973

Air Quality in the San Joaquin Valley Air Basin, Air Resources Board, September 1973

Merced County Health Department

A Guide in the Study of Environmental Pollution, W.A. Andrews, Prentice Hall, Inc., 1972

Politics of Land, Ralph Nader's Study Group Report on Land Use in California, 1973

Noise Abatement and Control: Departmental Policy, Implementation Responsibilities, and Standards, Circular 1390.2, U.S. Department of Housing and Urban Development

Exploring Urban Problems, Melvin R. Levin, Boston University, 1971

Noise - The Third Pollution, Theodore Berland, Public Affairs Committee, Inc., 1970

Jet Engine Aircraft Noise and the Community, Castle Air Force Base, 1972

Effects of Noise on Wildlife and Other Animals, U.S. Environmental Protection Agency, December 1971

The Social Impact of Noise, U.S. EPA, Dec. 1971

Report to the President and Congress on Noise, EPA, Feb. 1972

The Closing Circle, Barry Commoner, Alfred A. Knopf, N.Y., 1972

Future Environments of North America, Frazer Darling, A Natural History Press, 1966

Environmental Conservation, Raymond F. Dasman, John Wiley & Sons, 1972

Vanishing Air, Ralph Nader's Study Group Report, Grossman Publishers, N.Y.

ORDINANCE NO. 713

An Ordinance of the County of Merced, supplementing Zoning Ordinance No. 309 by creating Open Space Overlay Regulations for "Environmental Constraint Areas" in Base Zoned Districts. This Ordinance shall be known as the "Open Space Overlay Ordinance."

ARTICLE I - General

Section 1. Authority - The establishment of Open Space Overlay Regulations for Environmental Constraint Areas in Base Zoned Districts contained herein are pursuant to the action of the California State Legislature via Title 7, Section 65000, and specifically Sections 65563 and 65910 of the Government Code.

ARTICLE II - Purpose

Section 1. Purpose - The purpose of this ordinance is to regulate Land Uses in Environmental Constraint Areas in Base Zoned Districts of the unincorporated area of the County in order to:

A. Promote and preserve open space for public health, safety and general welfare of the present and future residents of the County of Merced, or, if developments are permitted, to enforce strictest building and grading standards for the safety of the public.

- B. Secure and provide the environmental, social, and economic advantages resulting from an orderly and planned conservation of resources.
- C. Regulate and preserve an open space system which relates to the rural and urban need of the County of Merced.
- D. Regulate and preserve valuable production areas of the County including prime agricultural and grazing areas.

ARTICLE III - Definitions

Section 1. Definitions - The following terms are to be used in connection with land uses in Environmental Constraint Areas, which are regarded as fulfilling the requirements for open space:

- A. "Agricultural Land" means land actively used for the purpose of producing an agricultural commodity for commercial purposes. Land may be considered to be "actively used" notwithstanding the fact that in the course of good agricultural practice it is permitted to lie idle for a period up to one year.
- B. "Local Open Space Plan" is the Open Space Element of the County's General Plan, adopted by the Board of Supervisors on September 4, 1973.

- C. "Open Space for Natural Resource Preservation" means areas required for the preservation of plant and animal life, including habitat for fish and wildlife species; areas required for ecologic and other scientific studies; rivers, streams, lakeshores, banks of rivers and streams, and watershed lands.
- D. "Open Space for Managed Production of Resources" means forest lands, rangeland, agricultural lands and areas of economic importance for the production of food or fiber; areas required for recharge of groundwater basins; marshes, rivers, and streams which are important as wildlife habitat or spawning areas; areas containing major mineral deposits, including those in short supply.
- E. "Open Space for Outdoor Recreation" means areas of outstanding scenic, historic and cultural value; areas particularly suited for park and recreation purposes, including access to lake shores, beaches, rivers and streams; areas which serve as links between major recreation and open space reservations, including

utility easements, banks of rivers and streams, trails, and scenic highway corridors.

- F. "Open Space for Public Safety" is land, including, but not limited to areas which require special management or regulation because of hazardous conditions such as earthquake fault zones, unstable soil areas, flood plains, watersheds, areas presenting high fire risks, areas required for the protection of water quality and water reservoirs, and areas required for the protection and enhancement of air quality.
- G. "Environmental Constraint Areas", described above in paragraphs C, D, E, and F, are shown on Maps I - VI in the Open Space Element, Seismic Safety, and other Elements to the County's General Plan. Also data furnished by the California Division of Mines and Geology and other governmental agencies.
- H. "Development" - The Public Resources Code, Section 27103, defines development as:
- "Development means, on land, in or under water, the placement or erection of any solid material

or structure; discharge or disposal of any dredged material or of any gaseous, liquid, solid, or thermal waste; grading, removing, dredging, mining, or extraction of any materials; change in the density or intensity of use of land, including, but not limited to subdivision of land pursuant to the Subdivision Map Act and any other division of land, including lot splits; changing the intensity of use of water, ecology related thereto, or of access thereto; construction, reconstruction, demolition, or alteration of the size of any structure, including any facility of any private, public, or municipal utility, and the removal or logging of major vegetation. As used in this section, "structure" includes, but is not limited to, any building, road, pipe, flume, conduit, siphon, aqueduct, telephone line, and electrical power transmission and distribution line."

ARTICLE IV - Establishment of Combining Districts

Section 1. Zoning Districts - All zoning districts are designated combining districts for the purpose of open

space overlay zoning. In the event of conflicting provisions of such a "combined district", the requirements of the "Open Space Overlay" shall take precedence over the requirements of the base districts.

ARTICLE V - Application

Section 1. Application - Each project will be dealt with on a "project by project" basis, and detailed information will be needed. Applications for any significant project should contain at least the following technical information:

- A. A map showing the location of the proposed project.
- B. A topographic map of the site with at least five foot contours indicated.
- C. Geologic and soil characteristics of the site should be indicated on a similar map in sufficient detail to determine the potential risk of erosion, landslides, and earthquakes, and the capacity of the soil to absorb storm water runoff and liquid wastes.
- D. The drainage characteristics of the site should be indicated on a similar map including all

drainage channels, streams, rivers, ponds, reservoirs, marshes, etc., and their peak capacities as well as any subsurface water and water recharge areas.

- E. Existing vegetation should be indicated on a similar map in sufficient detail to determine the location and maturity of all trees, the extent of any ground cover, and the location and extent of each variety of vegetation.
- F. Fish or wildlife that exist at any time of the year on the site should be adequately described.
- G. Existing structures, impervious surfaces and uses should be shown on a similar map as well as any areas of historical, cultural, archeological or scientific interest.
- H. All existing utilities, roads, schools, and other public and private facilities necessary to serve the proposed development shall be adequately described as to location and capacity.

All of the above information should be shown on maps for the proposed project. The following should be described in detail:

- I. Any protective devices to prevent erosion, dust, unnecessary destruction of vegetation, etc., during the construction period should be adequately described.
- J. The impact of the proposed project on the immediate site and on the surrounding areas should also be concisely described.
- K. Any other information of a similar nature that the Planning Director finds necessary to adequately evaluate the proposed project with respect to the considerations expressed in the California Environmental Quality Act, and the requirements for the Open Space Element.

ARTICLE VI - Standards

Section 1. Standards - The standards governing the issuance of permits for developments in environmental constraint areas, from here on called "Environmental Permits", should include the Following considerations:

- A. That the development will not have any substantial adverse environmental or ecological effect.
- B. That the development is not proposed to be done in a hazardous area that may endanger

life or property of occupants, and that the developer has been made aware of these facts.

- C. That the development will not have any substantial adverse effect on the execution of the General Plan or any Element thereof.

Section 2. Conditions - All environmental permits shall be subject to reasonable terms and conditions in order to ensure:

- A. That any development shall be designed and located so as to be as unobtrusive as possible consistent with reasonable utilization for permitted uses.
- B. Public access to and use of recreation areas, parks, reservoirs, natural reserves, and areas of significant scenic, scientific, educational, geological, historical, or cultural value to be preserved and protected to the maximum possible extent.
- C. Alterations to existing land forms and vegetation, and the construction of improvements shall cause the minimum possible adverse effect to scenic or other natural resources, and the minimum danger of floods, landslides, erosion, siltation, or failure in the event of an earthquake.

- D. Adequate provisions are made for solid and liquid waste treatment, disposition, and management which will minimize both short-term and long-term adverse effects upon the environment and resources of the County.
- E. That trees and other natural vegetation on the land shall be preserved whenever reasonable use can be made of the land without removing or otherwise disturbing or endangering such trees or vegetation.
- F. That cuts and fills are minimized to the maximum possible extent in order to prevent danger to scenic resources, and minimize the risk of erosion, siltation, and surface and subsurface instability and the damage caused by same.
- G. That roads, streets, highways, and utilities are located and designed to produce the minimum amount of pressure for further development in "environmental constraint areas".
- H. That the development is consistent with the natural characteristics of the "environmental constraint area".

- I. That no development takes place that would create a foreseeable risk of significantly reducing the air quality in the area of the development, or other areas of the region.
- J. That no development takes place that would create a foreseeable risk of significantly reducing water quality or quantity.
- K. That no development significantly interferes with or detracts from the view of any significant topographic, geographic, or scenic feature from any road, highway, park or recreation area.
- L. That development be discouraged in an area that presents a significant risk of damage to life or property because of possible floods, erosion, earth movement or subsidence, or earthquakes.
- M. No development should be permitted which would necessitate undue public expenditures for the installation or maintenance of utilities or other capital improvements. Undue public expenditures mean that the capitalized value of the anticipated expenditures

attributable to the proposed development exceeds the costs for alternative locations.

- N. Development which has a significant potential for inducing further development of an urban character within the environmental permit area shall be prohibited unless there are no suitable, alternative locations for such development within the jurisdiction, but outside the permit area.
- O. Where land is reasonably capable of economically supporting agriculture, grazing, the commercial extraction of forest products, or the commercial extraction of minerals, no development shall be permitted unless it is consistent or compatible with such use. Exception: Other uses may be permitted if the proposed development does not have an adverse environmental impact.
- P. The construction of impervious surfaces should be limited to those locations and amounts as will not create a foreseeable risk of increasing the rate of soil erosion from precipitation or storm water runoff, or damage to personal or real property from flooding.

ARTICLE VII - Permits

- Section 1. Permits - Developments within an environmental constraint area shall be required to obtain an "Environmental Permit" which shall contain certain specified conditions for the proposed development.
- Section 2. Requirements - Permit Applications shall be in conformance with Sections V and VI of this ordinance.
- Section 3. Exceptions - Developments not requiring an "Environmental Permit" are as follows:
- A. Projects which have been approved before the effective date of this ordinance, and which have acquired vested rights through substantial expenditures in reliance upon the previous approval.
 - B. Repair and improvements to existing single family homes.
 - C. Development for purposes of public outdoor recreation within publicly owned lands.
 - D. Maintenance or repair of utility facilities.
 - E. Maintenance or repair of roads and highways.
 - F. Repair and maintenance of public buildings or structures.

G. Uses other than those specifically mentioned may be exempted, provided such uses are similar and in the opinion of the Planning Commission and Board of Supervisors as evidenced by a resolution to that effect and that are in keeping with the intent of this ordinance. These matters can be satisfactorily handled through existing building permit procedures.

ARTICLE VIII - Supplemental Ordinances

Section 1. Ordinances supplementing "Open Space Overlay Ordinance" - The following ordinances, previously adopted, are incorporated into the "Open Space Overlay Ordinance.":

1. Ordinance No. 298 - An ordinance requiring a permit to drill for oil, gas, and other hydro-carbon substances.
2. Ordinance No. 463 - Merced County Fire Prevention Code.
3. Ordinance No. 446 - Excavating and Grading
4. Ordinance No. 510 - Airport Zoning
5. Ordinance No. 586 - Flood Plain Land Use

ARTICLE IX - Enforcement and Penalty

Section 1. Enforcement - The Planning Department shall be the enforcement agency for this ordinance.

Section 2. Penalty - Any person, firm or corporation, whether as principal, agent, employee or otherwise, violating any provisions of this ordinance, shall be deemed guilty of a misdemeanor, and upon conviction thereof, shall be punishable by a fine of not more than five hundred dollars (\$500), or by imprisonment in the County Jail for a period of not more than six (6) months or both, such fine and imprisonment. Each day that violation of this ordinance continues shall be considered a separate offense.

ARTICLE X - Validity

If any section, sub-section, paragraph, sentence, clause or phrase of this ordinance is for any reason held to be invalid or unconstitutional by the decision of any court of competent jurisdiction, such decision shall not affect the validity of the remaining portions of this ordinance. The Board of Supervisors hereby declares that it would have passed this ordinance, and each section, sub-section, sentence, clause and phrase thereof, irrespective of the fact that any one or more sections, sub-sections, sentences, clauses, or phrases be declared invalid or unconstitutional.

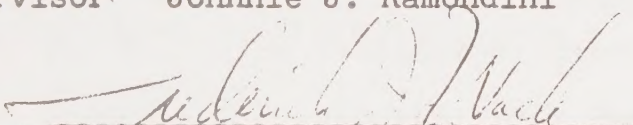
This ordinance shall take effect thirty days after its passage and prior to the expiration of fifteen days after the adoption thereof shall be published in a newspaper in general circulation within the County of Merced.

Adopted by the Board of Supervisors of Merced County on December 18, 1973 by the following vote to wit:

AYES: Supervisors Fred Wack, E. G. Nordman,
Al Goman

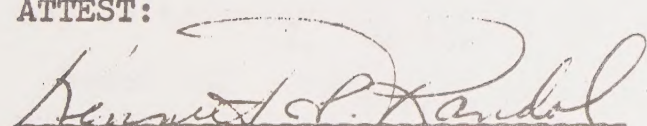
NOES: None

ABSENT: Supervisor Johnnie J. Ramondini


FREDERICK J. WACK, Chairman of
the Board of Supervisors of the
County of Merced, California

(SEAL)

ATTEST:


KENNETH L. RANDOL, County Clerk
and Ex-Officio Clerk of the
Board of Supervisors of the
County of Merced, California

U.C. BERKELEY LIBRARIES



C101742240